This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

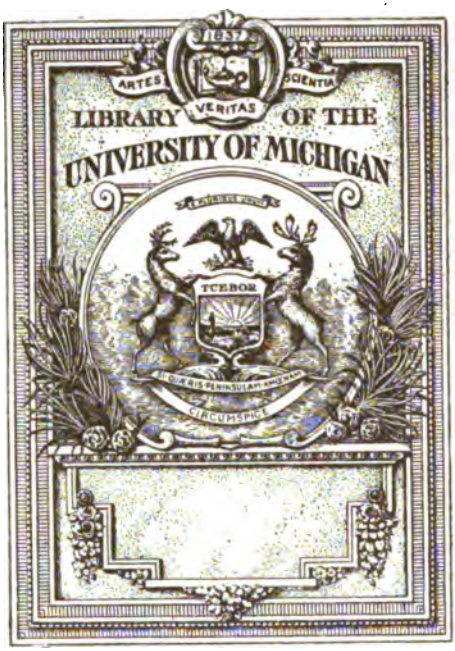
+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

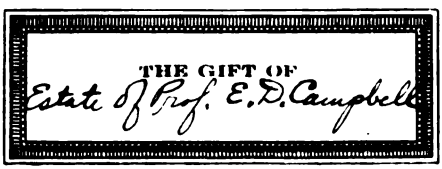
About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

B 468933

Digitized by Google





Digitized by Google

hemical Lib
QD
1
.R4
Copy

Digitized by Google

Digitized by Google

REVIEW

—OF—

American Chemical Research

VOL. VIII. 1902.

WILLIAM A. NOYES, Editor.

REVIEWERS.

PHYSICAL CHEMISTRY.....A. A. Noyes and H. M. Goodwin
INORGANIC CHEMISTRY.....H. N. McCoy
MINERALOGICAL AND GEOLOGICAL CHEMISTRY.....W. F. Hillebrand
ANALYTICAL CHEMISTRY.....
.....L. M. Dennis, E. M. Chamot, B. S. Cushman and Benton Dales
METALLURGICAL CHEMISTRY.....J. W. Richards
ORGANIC CHEMISTRY.....M. T. Bogert
BIOLOGICAL CHEMISTRY.....F. P. Underhill
PHARMACEUTICAL CHEMISTRY.....J. O. Schlotterbeck
SANITARY CHEMISTRY.....L. P. Kinnicutt
INDUSTRIAL CHEMISTRY.....A. H. Gill, C. J. Moore and S. P. Sadtler
AGRICULTURAL CHEMISTRY.....D. W. May and H. W. Lawson
PATENTS.....W. H. Seaman

EASTON, PA.:
THE CHEMICAL PUBLISHING COMPANY.
1902.

Digitized by Google

gift
Estate of Prof. E. D. Campbell
8-16-?

Digitized by Google

REVIEW OF AMERICAN CHEMICAL RESEARCH.

VOL. VIII. No. 1.

WILLIAM A. NOYES, Editor.

REVIEWERS:

M. T. Bogert, Benton Dales, W. F. Hillebrand, D. W. May, A. A. Noyes, J. O. Schlotterbeck, E. M. Chamot, L. M. Dennis, L. P. Kinnicutt, H. N. McCoy, J. W. Richards, F. P. Underhill, B. S. Cushman, A. H. Gill, H. W. Lawson, C. J. Moore, W. H. Seaman.

INORGANIC CHEMISTRY.

Generalizations on Double Halogen Salts. BY H. C. WELLS. *Am. Chem. J.*, **26**, 389–408. The author has classified about five hundred double halides with the view of showing the possible relations between valency, chemical nature, etc., and the type to which the double salt belongs. The double salts studied were made up of the halidies of the alkali metals, of ammonium, and of thallium on the one hand, with halides of more electro-negative univalent to quinquivalent metals, on the other. The term type refers to the composition of the double salt as shown by the ratio of the number of molecules of alkali metal halide to the number of molecules of negative metal halide contained in a molecule of the double salt. The salts considered exhibit fifteen types. The classification shows that simple types are most common. The number of salts belonging to each of the more prominent types is as follows: 2 : 1, 207; 1 : 1, 147; 3 : 1, 61; 3 : 2, 26; 1 : 2, 18; 4 : 1, 15; 2 : 3, 6; all other types, 14. The total number of salts was 494. In the above ratios the antecedent refers to the alkali halide. From these figures it appears that 84 per cent. of the salts belong to the first three types and that these with the next four types comprise 97 per cent. of the whole number. The valency of the negative metal seems to have but little effect in determining the type of double salt formed. However, the 3 : 1 and 3 : 2 types are most frequently found among double salts containing trivalent metals. Not many regularities appear in the classification, but it seems that the ease of double salt formation increases with the change from iodides to fluorides. The same two halide salts often unite in more than one ratio. The maximum number of double halides observed from any pair of salts is five. There is no apparent relation between the amount of water of crystallization of the double halides and other properties. H. N. McCOY.

On Gold Halides. BY FELIX LENGFELD. *Am. Chem. J.*, **26**, 324–332. The methods of preparation and the properties of the

Digitized by Google

gold halides have been studied in connection with an attempt to prepare silver salts of hydrochlorauric and hydrobromauric acids. Aurous chloride is best prepared by heating auric chloride for several days to 175° C., instead of 150° (Figuier) or 185° (Thomsen). Aurous chloride dissolves in a solution of sodium chloride. On standing, part of the gold is deposited, often as an excellent mirror. Sodium chloraurate remains in the solution. Bromides act similarly but more rapidly. Aurous bromide was made by heating hydrobromauric acid on the water-bath for three hours and then to 105° for twelve hours. The product contained some free gold. Aurous bromaurate, Au_2Br_4, was made by the action of dry bromine on finely divided gold in the cold. The product is not pure but contains a little free gold or aurous bromide and also some auric bromide. The latter can be extracted with ether. Aurous bromaurate is a steel-blue powder. Hydrochlorauric acid crystallizes with three instead of four molecules of water. Hydrobromauric acid crystallizes with six molecules of water instead of five, as given by Thomsen. Dried over phosphorus pentoxide the acid has three molecules of water.

H. N. McCoy.

On the Mixed Crystals of Copper Sulphate and Zinc Sulphate. By H. W. Foote. *Am. Chem. J.*, **26**, 418–428. In the formation of mixed crystals from certain pairs of salts there is a limit to the degree of miscibility. It had been predicted, upon theoretical grounds, that the limiting composition of these mixed crystals was a function of the temperature. The author has shown experimentally the truth of this prediction, using the sulphates of copper and zinc. Complete miscibility of the crystals of this pair of salts does not occur between 12° and 56°, the range of temperature of the experiments. The salts form four varieties of mixed crystals, *viz.*, 1, triclinic, with $5H_2O$; 2, monoclinic, with $7H_2O$; 3, orthorhombic, with $7H_2O$; 4, above 40° the latter has but $6H_2O$. To insure the formation of crystals of limiting composition such solutions were chosen that upon evaporation gave, simultaneously, two kinds of mixed crystals. These were then separated mechanically and analyzed. The results agree well with theoretical conclusions. H. N. McCoy.

On the Isomorphism of Selenates and Tellurates. By James F. Norris and William A. Kingman (second paper). *Am. Chem. J.*, **26**, 318–324. The authors have attempted to find further examples of isomorphism of compounds of tellurium with those of selenium. Several new salts were prepared and analyzed. $RbHTeO_4.\frac{1}{2}H_2O$, amorphous powder or crystalline crust. $CsHTeO_4.\frac{1}{2}H_2O$, white powder or crystals. $RbHSeO_4$, hydroscopic crystals, very soluble in water. $CsHSeO_4$, large flat plates, very hydroscopic. $Rb_2TeO_4.3H_2O$, prisms. No pair of salts, either anhydrous or containing the same amount of water

Digitized by Google

of crystallization, was obtained from any one base with each acid. However, as the acid rubidium salts differ by only half a molecule of water, an attempt was made to obtain mixed crystals. The analysis of the crystals showed that the salts are not isomorphous. H. N. McCoy.

On the Inert Constituents of the Atmosphere. By W. Ramsay. *Pop. Sci. Monthly*, **59**, 581–596. The paper is a popular discussion of the important results, on the above subject, that have been published in various scientific journals during the last seven years. H. N. McCoy.

The Spectra of Hydrogen and Some of Its Compounds. By John Trowbridge. *Am. J. Sci.*, **162**, 310–318. From a study of the spectra of hydrogen, oxygen and nitrogen in tubes with carbon terminals, and of gaseous compounds of these elements with carbon (C_2H_2, CO, CO_2, C_2N_2) in tubes with metallic terminals, the tubes being submitted to condenser discharges and most of them also to continuous currents, the author draws the following conclusions:

1. Hydrogen is an insulator.
2. The passage of electricity through hydrogen, nitrogen, oxygen and their gaseous compounds is conditioned by the water vapor present.
3. The dissociation of this water vapor in the case of tubes filled apparently with pure hydrogen, under the effect of a strong steady current of electricity, shows an electrolytic action closely analogous to that of the voltaic cell. In the case of electrolytic copper terminals in an atmosphere of hydrogen, pure copper is deposited at the negative terminal, and a suboxide of copper at the positive terminal.
4. Under the effect of powerful condenser discharges oxygen is set free from commercial aluminium and magnesium.
5. When powerful discharges are employed, certain carbon bands are always present in glass tubes filled with hydrogen, nitrogen, oxygen and ammonia gas, notwithstanding the greatest care which may be taken in submitting them, during the process of exhausting, to a high temperature.
6. The brilliancy of the light of tubes filled with hydrogen diminishes as the process of the dissociation of water vapor goes on and the resistance of the tube increases. It is possible to raise such a tube to the X-ray stage from a pressure of 1–2 mm. merely by the application of a strong steady current.
7. The X-rays excited by the application of a steady current are due to the radiations set up by the dissociation of highly rarefied water vapor. Benton Dales.

An Investigation of the Spectra of Flames at Different Periods During the Basic Bessemer Blow. By W. N. Hart-

Digitized by Google

LEY AND HUGH RAMAGE. *Eng. Min. J.*, **72**, 423. From spectroscopic observations and from photographs of the spectra of the flames, the authors have been led to conclude: that the immediate production of visible flame is due to carbonaceous matter in the lining of the vessel, and its luminosity to the volatilization of alkalies and to incandescence of lime dust carried out by the blast; that the smaller quantity of silicon in the metal blown causes much volatilization of metal at an early period in the blow; that the oxidation of metal and phosphorus in iron phosphide causes a large amount of fume at a later period; and that the overblow is characterized by an illumination from what appears to be a brilliant yellow flame, a dense fume of oxidized metallic vapors being produced at the same time. They find that the five alkalies seen in the flame spectra may be traced mainly to the lime; and the manganese, copper, silver, and gallium to the metal. They also give a new line of potassium, which has a wave-length of 4642. BENTON DALES.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

Contiguity of Ore Deposits of Different Generic Relationships. BY CHAS. R. KEYES. Abstract of paper read before the American Institute of Mining Engineers, Mexican meeting, November, 1901, in *Eng. and Min. J.*, **72**, 597–598. The fact well recognized by students of rock metamorphism, "ttha the same kind of materials may have in the same limited area, and even in the same rock mass, a diverse genesis," is believed to have direct and important bearing in solving local problems of ore genesis, and particularly those of the lead and zinc deposits of Missouri and Arkansas, thereby harmonizing wide differences of published opinion.

For the lead and zinc deposits of the Ozark region the following four distinct types of genesis have been observed: "(1) Fumarole impregnation, or pneumatolysis; (2) fissure occupation, in which heated waters rise from the depths; (3) precipitative action, or reduction in contact with organic matter; (4) crevice accretion, in joint spaces and porous layers, and derived from ordinary underground waters." While the last type no doubt explains the existence of most of the lead and zinc deposits of the Mississippi valley, many are not to be accounted for in this way. "Any theory accounting for the presence of these ore bodies must take into consideration a number of very different geological processes, geological conditions, and geological structures."

W. F. HILLEBRAND.

Note on Certain Copper Minerals. BY A. N. WINCHELL. *Am. Geologist*, **28**, 244–246. Hausmann and Plattner long ago observed the accidental production of chalcopyrite in metallurgical operations. The author describes a formation of this mineral

Digitized by Google

covered with films of bornite in the Allen O'Harra calciners at the smelter of the Butte and Boston Consolidated Mining Company, at Butte, Montana. The chalcopyrite forms along the rails in the bed of the furnace, even almost wholly replacing them and attaining a maximum thickness of about four inches in from six months to a year. Small crystals were found in a cavity. Both minerals "have been formed by sublimation, and not by fusion, since the temperature of the furnace never rises high enough to fuse the ores present." Analyses are given.

W. F. HILLEBRAND.

The Caliche of Southern Arizona. By W. P. BLAKE. Abstract of paper read before the American Institute of Mining Engineers, Richmond meeting, February, 1901, in *Eng. and Min. J.*, **72**, 601. Caliche in Arizona and Mexico is a name applied, not to soda-niter beds as in South America, but to a porous calcareous formation 3–15 feet thick, lying a few inches or feet beneath the surface, and distributed over very wide areas. The top is much more dense than the lower parts of the bed, which are porous, often cavernous, earthy, and blend gradually with the underlying sand and gravels. Besides calcium carbonate the caliche contains some calcium, magnesium and aluminum silicates. It makes a strong lime, but is not compact enough for building purposes. Instead of being a deposit from ancient lakes as generally supposed, the author holds that facts show it to have resulted from "the upward flow of calcareous water, induced by constant and rapid evaporation at the surface in a comparatively rainless region," an explanation which may account for other surface deposits of easily soluble minerals, of some gypsum beds and even of metallic sulphides. The compacting of the upper layers he ascribes to surface leaching of the soil by occasional rains, whereby the calcareous solution is turned back and downwards till it meets the upward flow. The author regards the presence of caliche over extended areas as good evidence of the present or former existence of subterranean water.

W. F. HILLEBRAND.

The Clays and Clay Industries of Wisconsin. By E. R. BUCKLEY. *Wis. Geol. and Nat. Hist. Survey. Bull. No. VII (Part I). Economic Series, No. 4.* 1901. 304 pages. This report, intended for the general public and the brickmaker, supplements the earlier reports of Chamberlin and Irving. The greater part is taken up with descriptions of the numerous clay beds and brick and tile factories, preceded by a chapter on the methods of manufacture of brick and drain tile in Wisconsin, but the opening chapters are devoted to brief statements of the origin, composition, properties, behavior, and classification of clays. With respect to the latter the author offers the following modification of Ladd's geological system:

Digitized by Google

I. *Residual derived from*—A, *Granite or Gneissoid rocks;* B, *Basic igneous rocks;* C, *Limestone or dolomite;* D, *Slate or shale;* E, *Sandstone.* II. *Transported by*—A, *Gravity assisted by water;* B, *Ice;* C, *Water;* 1, Marine; 2, Lacustrine; 3, Stream; D, *Wind.* Loess.

In chapter V, we learn that the residual clays are far less extensive than the transported and that of the latter the lacustrine deposits probably exceed those deposited in any other way. In an appendix are given the methods employed in the examination of the clay deposits, mainly chemical, by S. V. Peppel. The report concludes with a table of 106 chemical analyses by S. V. Peppel and W. S. Ferris, which seem to have been made with more than usual care and from which the rational composition and Bischoff's refractory quotient have been in each case calculated. A third table gives analyses of 46 typical clays in other states. The results of physical tests will appear later.

W. F. HILLEBRAND.

A Preliminary Report on a Part of the Iron Ores of Georgia (Polk, Bartow and Floyd Counties). BY S. W. MCCALLIE. *Geol. Survey, Georgia, Bull., No. 10–A,* 1900, 190 pages. Of the two commercially important ores of these counties, limonite and hematite, the former is far the more abundant. Numerous partial analyses accompany the report, which is almost wholly given up to descriptions of all the openings, developed and undeveloped, that have been made. The brown iron ores are mainly confined to two geological formations, the Knox dolomite series and the Cambrian quartzites. They occur chiefly in the form of pockets or irregular deposits in the residual clays and are often of very superficial extent. Regarding their origin the author prefers the theory of C. W. Hayes ("Geological Relations of the Iron Ores in the Centreville District, Georgia," *Trans. A. I. M. E.*, 1900), to that of the former state geologist, J. W. Spencer ("The Palaeozoic Group," Geological Survey of Georgia, pages 151 and 207). W. F. HILLEBRAND.

Corundum Deposits of Canada. *U. S. Cons. Rep.*, 67, 284. —Consul-General Bittinger reports that the recently discovered deposits north of Kingston, Ont., cover a large area, are accessible and easily worked, though as yet almost undeveloped. No gems have as yet been found. Corundum of 95 per cent. purity is now being produced at Combermere by the Canada Corundum Co. W. F. HILLEBRAND.

On the Petrography of Shefford Mountain. BY JOHN A. DRESSER, Richmond, Quebec, with Chemical Analyses by M. FRANK CONNOR, Ottawa, Ont. *Am. Geologist,* 28, 203–213. Shefford Mountain, in the county of Shefford, about fifty miles east of Montreal, is the easternmost member of a series of vol-

Digitized by Google

canic elevations crossing the valley of the St. Lawrence in the latitude of Montreal. It is inferred to be "an uncovered laccolith rather than the denuded neck of a once active volcano." Three classes of rocks belonging to as many periods of irruption are distinguishable, namely, essexyte, nordmarkyte, and pulaskyte in the order of intrusion. It is concluded "that the igneous rocks of Shefford are only slightly differentiated products of a single magma." In chemical composition, the latest intrusive pulaskyte is almost the exact mean between the essexyte and nordmarkyte of the first and second irruptions.

W. F. HILLEBRAND.

Portland Cement. History, Uses, Process of Manufacture, Methods of Testing, Etc. By W. S. BLATCHLEY. *25th Ann. Rep. Ind. Dept. Geol. and Nat. Res.*, pp. 1–30, 1900.—In addition to the subjects noted in the subtitle, the article is partly statistical, and closes with a brief account of the Portland cement industry in Indiana. W. F. HILLEBRAND.

Perknite (Lime-Magnesia Rocks). By H. W. TURNER. *J. Geol.*, 9, 507–511.—The author proposes to call by this name a class of rocks containing less alumina than diorites and gabbros, and less magnesia than peridotites, the chief mineral constituents being monoclinic amphibole and monoclinic pyroxene, the secondary constituents, rhombic pyroxene, olivine and feldspar, and the accessories biotite, iron ore, etc. Only one of the primary constituents may be present with none of the secondary or accessory constituents. This necessitates redefinition of the term peridotite, which becomes chemically a magnesia rock with usually less than 6 per cent. of lime. Several analyses, only one new, are given. W. F. HILLEBRAND.

A Second Contribution to the Natural History of Marl. By CHAS. A. DAVIS. *J. Geol.*, 9, 491–506.—Additional evidence of the important part played by algae, especially chara, in the formation of marl or lake lime deposits in the fresh-water lakes of Michigan is adduced. The chemical part of the investigation was concerned with the concentration and precipitation of calcium carbonate, which is found on the outside of chara as an incrustation made up of crystals. The cell contents were found, by different observers and independent methods, to contain in solution a single calcium salt, apparently the succinate. It is suggested that the compound accumulates in the cells until it reaches sufficient density to begin to diffuse through the cell walls by osmosis, and that during diffusion or afterwards it is converted into the carbonate. W. F. HILLEBRAND.

The Lakes of Northern Indiana and Their Associated Marl Deposits. By W. S. BLATCHLEY AND GEORGE S. ASHLEY. *25th Ann. Rep. Ind. Dept. Geol. and Nat. Res.*, 1900, pp. 31–321.

Digitized by Google

—The early pages of this report contain a short account of the origin and deposition of marl in the still water of lakes and ponds, with the following summary of conclusions: *First*—That the marl deposits of Indiana have been formed in still waters of lakes now in existence, or in former lakes, now extinct. *Second*—That the original source of the marl material is the glacial clay in the region surrounding the lakes. *Third*—That the deposition of the marl is caused by the loss of carbon dioxide from the sub-aqueous spring waters which bear the marl material into the lakes. *Fourth*—That the loss of carbon dioxide is, for the most part, caused in three ways; *viz.*, (*a*) By the increase in temperature of the incoming spring waters; (*b*) By the decrease in pressure as the spring water rises to the surface of the lake; (*c*) By the action of different aquatic plants in abstracting the carbon dioxide for food.

The reader should consult in this connection a paper of more recent date by Chas. A. Davis in the *Jour. of Geol.*, *IX* (see preceding abstract), in which new evidence of the active part played by certain algae, notably chara, in the production of marl is brought forward.

A table of analyses of twenty-three marls from Indiana and one from Michigan concludes the report. W. F. HILLEBRAND.

Oolite and Oolitic Stone for Portland Cement Manufacture. By W. S. BLATCHLEY. *25th Ann. Rep. Ind. Dept. Geol. and Nat. Res.*, 1900, pp. 322–330.—The advantages of the Indiana deposits of the above nature for making Portland cement are dwelt upon and supported by numerous analyses showing a high degree of purity. "No other stone in the United States shows such a uniformity of composition over so large an area."

W. F. HILLEBRAND.

The Silver Creek Hydraulic Limestone of Southeastern Indiana. By C. E. SIEBENTHAL. *25th Ann. Rep. Ind. Dept. Geol. and Nat. Res.*, 1900, pp. 331–389.—"A magnesian argillaceous limestone with a mixture of more or less ferric iron." Analyses of five samples by W. A. Noyes are given besides twelve others from New York, Illinois, Wisconsin, and Kentucky for comparison. W. F. HILLEBRAND.

The Indiana Oolitic Limestone Industry in 1900. By C. E. SIEBENTHAL. *25th. Ann. Rep. Ind. Dept. Geol. and Nat. Res.*, 1900, pp. 390–393.—Concludes with a brief statistical table.

W. F. HILLEBRAND.

The Constituents of Meteorites. By O. C. FARRINGTON. *J. Geol.*, 9, 393–408, and 522–532.—The author continues his useful "Studies for Students" (see abstract, this Journal, **23**, 140).

W. F. HILLEBRAND.

Digitized by Google

The Geology of Allegany County. By C. C. O'Harra. *Maryland Geol. Survey, Allegany County*, pp. 57–164, 1900. Contains no chemical data. W. F. Hillebrand.

The Mineral Resources of Allegany County. By Wm. B. Clarke, C. C. O'Harra, R. B. Rowe, and H. Ries. *Maryland Geol. Survey, Allegany County*, pp. 165–194, 1900.—This report covers coals, fire-clays, clays, shales, limestones, and cement materials, building stones, road materials, iron ore, natural waters, etc., but gives only a single analysis of a cement rock. W. F. Hillebrand.

The Soils of Allegany County. By C. W. Dorsey. *Maryland Geol. Survey, Allegany County*, pp. 195–216, 1900. Numerous mechanical analyses are given. W. F. Hillebrand.

The History of Mining in Newfoundland. By James P. Hawley. *The Canadian Mining Review*, **20**, 211–215.—A review of the present as well as the past history of the mineral industry of this colony. W. F. Hillebrand.

Report R. Section of Chem. and Mineralogy. 55 pages. *Ann. Rep. Geol. Survey of Canada*, **11**, 1898. By G. Chr. Hoffmann.—This report embraces analyses of natural waters, limestones, etc., assays of iron, nickel, gold and silver ores, etc.; also analyses of several minerals—polycrase, hübnerite, hydromagnesite, natron, celestite—some of which were hitherto unknown in Canada.

Report S. Section of Mineral Statistics and Mining. 196 pages. *Ann. Rep. Geol. Survey of Canada*, **11**, 1898. By E. D. Ingall.—A detailed statistical report of the mineral industries of Canada for 1898. W. F. Hillebrand.

Pyrite and Marcasite. By H. N. Stokes. *U. S. Geol. Survey, Bulletin No. 186*, July, 1900, pp. 50.[1]—The usual physical characteristics by which these geologically important forms of iron disulphide are distinguished, namely: Crystalline form, color, and density are not always to be depended upon, especially in the case of massive or concretionary forms. The crystalline form cannot always be made out, and the yellow color of pyrite or the white of marcasite can only be distinguished on freshly-cleaned and well-reflecting surfaces. The rapidity of vitriolization cannot be depended on to distinguish marcasite from pyrite, for while marcasite oxidizes more rapidly, the ratio of surface to mass, or the porosity, is so important a factor that in the absence of a knowledge of its magnitude, any conclusion is worthless. Formation or non-formation of free sulphur on treating with nitric acid (Penfield) fails to indicate pyrite mixed with marcasite.

[1] By request of Dr. Hillebrand, the author has furnished the abstract of this paper.

Digitized by Google

The author describes a chemical method for distinguishing the minerals, based upon determining the percentage of sulphur oxidized in sulphuric acid when an excess of the mineral is boiled with a standard solution of ferric ammonium alum containing 1 gram Fe''' and 4 grams H_2SO_4 per liter, under absolute exclusion of air, until the alum is completely reduced. The reaction takes place in two stages.

(1) $FeS_2 + Fe_2(SO_4)_3 = 3FeSO_4 + 2S.$
(2) $2S + 6Fe_2(SO_4)_3 + 8H_2O = 12FeSO_4 + 8H_2SO_4.$

The second reaction is always incomplete. The permanganate equivalent of the iron in the original solution (a) and of the ferrous iron (b) and total iron (c) of the resulting solution are determined. The increment of iron ($c-a$) gives the iron of the mineral decomposed; three times this gives the amount of ferrous iron formed in equation (1), and the difference between this and the total ferrous iron gives the amount of the latter formed by oxidizing sulphur. From these data are deduced the equation

$$p = \frac{8.333\ b}{c-a} - 25$$

where p represents percentage of sulphur oxidized or the *oxidation coefficient.* The oxidation coefficient varies with concentration and temperature (being greater at lower temperatures), but under easily controllable conditions is constant to within one-half unit. The oxidation coefficient of pyrite under standard conditions is 60.4, varying in different samples from 60 to 61, while marcasite gives an oxidation coefficient of 18, sometimes falling as low as 16.5. The conditions for success are chiefly careful freeing of the mineral from oxidation products and other substances which might exercise an influence on the titer of the solutions, and the absolute exclusion of air during the process. For a detailed account of the methods and apparatus by which these are accomplished reference must be made to the original. The theory of the process is that the reaction represented by equation (1) occurs more rapidly than that shown in (2), so that a portion of the sulphur is able to assume the free state, in which condition it is unattacked. Marcasite is more rapidly attacked, so that the oxidation of the sulphur falls still more behind than is the case with pyrite. The applicability of the method to other cases of dimorphism is pointed out.

The method is applied to determining the composition of mixtures of pyrite and marcasite. A curve is given, showing the oxidation coefficients of mixtures of pyrite and marcasite in every proportion, which was obtained by a large series of experiments with artificial mixtures, and by reference to this, the composition of any natural mixture may be determined with an accuracy varying from one per cent. in the case of mixtures rich in pyrite to two or three per cent. when they consist mainly of marcasite.

Digitized by Google

The compositions of numerous specimens were determined with the aid of this curve, the conclusions being that a large portion of the fibrous concretions passing as marcasite are really pyrite, and that the hypothesis of Julien that even well crystallized samples are very generally either intimate mixtures of the two minerals, or paramorphs of one after the other, is without foundation. The influence of various impurities is carefully studied and this influence eliminated, for which reference is made to the original. It is shown that it is possible by means of the oxidation coefficient to determine the form of combination of copper in a cupriferous pyrite containing as little as three per cent. or even less of copper.

A. P. Brown has proposed a theory that in marcasite the iron is wholly ferrous, while in pyrite, it is four-fifths ferric, this conclusion being based on experiments on the decomposing action of copper sulphate. The experiments of the author show that the only difference is in the rapidity with which they are attacked, marcasite decomposing more rapidly, but that otherwise, the products of decomposition are the same qualitatively and quantitatively, and that there is no experimental basis thus far for the view that the minerals differ in chemical constitution or as to the valency of the iron. In other experiments it is shown that the action of cupric solutions on pyrite, in the absence of air, results in the reduction of the copper to the cuprous state, with a corresponding oxidation of sulphur. Some experiments on the oxidation of pyrite and marcasite with potassium permanganate are described, from which it appears that here too, the percentage of sulphur oxidized in pyrite is greater than in marcasite, but the difference is not as great, nor does the method admit of sufficient refinement to render it of value. H. N. STOKES.

ANALYTICAL CHEMISTRY.

On the Estimation of Cesium and Rubidium as the Acid Sulphates and of Potassium and Sodium as the Pyrosulphates. BY PHILIP E. BROWNING. *Am J. Sci.*, **162**, 301–304.—Cesium nitrate and rubidium chloride were treated with an excess of sulphuric acid, and the excess of acid was removed by heating at from 250° C. to 270° C. Cesium and rubidium salts of volatile acids form under these conditions primary sulphates of the type $RHSO_4$. These sulphates change on ignition to the normal sulphates. The results given show the average error of the method to be about one half per cent. Sodium and potassium salts when subjected to similar treatment give pyrosulphates, these changing to normal sulphates on ignition. Lithium yields neither a primary sulphate nor a pyrosulphate. L. M. DENNIS.

Digitized by Google

The Determination of Persulphates. By CHARLES A. PETERS AND SETH E. MOODY. *Am. J. Sci.*, **162**, 367–376.—The following methods were studied by the authors: (1) the persulphate reacts with potassium iodide in a hot solution and the iodine set free is determined by thiosulphate (Mondolfo); (2) the persulphate reacts with potassium iodide in the cold and the iodine set free is determined by thiosulphate (Namias); (3) the persulphate is reduced by a ferrous salt (LeBlanc and Eckardt); (4) the persulphate is reduced by an arsenite solution (Grützner); (5) the persulphate, an excess of an arsenate, and a known weight of potassium iodide are brought together in a solution containing sulphuric acid. On boiling, the iodine is expelled and a portion of the arsenate is reduced to arsenite. This arsenite is reoxidized by iodine in the usual manner and the iodine in the potassium iodide less the amount required to reoxidize the arsenite is the iodine liberated by the persulphate.

The results obtained show that the arsenate-iodide method is the most accurate, but is less simple than the others. The Mondolfo method is simple and fairly accurate. Namias's method is slow because the solution must stand ten to twelve hours. Both of these methods tend to give low results. Grützner's method has the objection that the application of a correction is required. The method of LeBlanc and Eckardt is simple, rapid and convenient and the results agree well with those obtained by the accurate arsenate-iodide method.

B. S. CUSHMAN.

Colorimetric Estimation of Manganese. By HARRY E. WALTERS. *Age of Steel*, November, 1901, 23–24.—The author weighs off 0.2 gram of the test steel and a standard steel of known manganese content into suitable test-tubes, adds 10 cc. of nitric acid of 1.20 sp. gr., and heats in a water-bath until the samples are dissolved and all nitrous fumes are driven off. He then adds 15 cc. of silver nitrate solution equal to 0.02 gram of $AgNO_3$ (1.33 grams of the salt to 1 liter of water) and 1 gram of ammonium persulphate and continues the heating for about half a minute after oxidation begins. The tubes are then removed to a cold water-bath and, when cold, are compared as usual.

The results obtained on samples of steel, pig iron, and blast-furnace cinders by the lead peroxide and ammonium persulphate methods are identical in nearly every case. The persulphate method is shorter and costs less per determination than the lead peroxide method.

As ammonium persulphate causes complete oxidation only when damp, the author adds 10 cc. of water to each one pound bottle of the salt the day before it is used. B. S. CUSHMAN.

Digitized by Google

METALLURGICAL CHEMISTRY AND ASSAYING.

Notes on the Carolina Gold Deposits. By W. H. Weed. *Eng. Min. J.*, October 19, 1901.—The industry is at present inactive, although $20,000,000 to $30,000,000 has been extracted in the last fifty years. This inactivity is due to an antiquated system of mining and a lack of systematic development. The Theiss process has been successfully applied in the slate belt, but many ores are not suitable for this treatment. The crushed ore is slimy and the free gold very fine and flaky. Some of the gold is in pyrites, so that good extraction is dependent on previous roasting. Without roasting, an extraction of not over 60 per cent. is obtained, by any process, but after roasting (which costs 60 cents per ton) 90 per cent. extraction can be depended on. The cyanide process has a large field before it in treating these ores. J. W. Richards.

The Keystone Hydraulic Mine in Colorado. By Special Correspondent. *Eng. Min. J.*, 72, 424.—Description of a flume 12 by 6 feet, and 2500 feet long, giving a fall of 550 feet to supply two 8- or 10-inch nozzles. The stream is thrown 450 feet, and washes about 15,000 cubic yards in twenty-four hours. The company owns 700 acres of placer gravels, averaging fifty cents per yard, and the present flume and pipe line command eighty million cubic yards. J. W. Richards.

Notes on the Mining and Metallurgical Industries of Mexico. By Jos. Struthers. *Eng. Min. J.*, October 26, 1901.—A lengthy description of the general geology and mineral resources of Mexico. The introduction of modern methods of mining and treating the ores and the extension of railways have revived these industries, and the writer believes that this will soon take a foremost rank among the metal-producing countries of the world. Nearly half of the world's production of silver comes from Mexico; 90 per cent. of this is obtained from lead ores; about one-quarter is refined in the country, the rest is exported as ore, mattes or base bullion. The gold, copper, and lead industries are flourishing, and mercury is being extracted to the amount of 335 tons yearly. The historic Patio process is being largely replaced by more efficient modern methods of stamping, amalgamating and washing, resulting in better extraction at lower cost. At Monterey, was erected the first Park's process lead refinery in Mexico, with a daily capacity of 40 tons of base bullion; it is accompanied by an electrolytic plant for separating gold and silver by the Moebius process. It is only in a few parts of Mexico, however, that it pays to produce the refined silver.

J. W. Richards.

Digitized by Google

The Sierra Mojada, Coahuila, Mexico, and Its Ore Deposits. By J. W. MALCOLMSON. *Min. and Met.*, October 15, 1901.—A paper to be read at the Mexican Meeting of the American Institute of Mining Engineers, November, 1901. Average ore carries 10 ounces of silver per ton and 15 per cent. of lead; production, 200,000 tons yearly. Immense bodies of lower grade ore are in sight. The mines are in limestone on the lower slope of the mountain, partly covered by breccia and alluvium. Most of the foremen and superintendents are Americans or Europeans; the Mexican miners average $0.75 United States currency per day. J. W. RICHARDS.

Cobaltiferous Quartz in the State of Jalisco, Mexico. By F. CHISHOLM. *Eng. Min. J.*, October 26, 1901.—Telluride of silver occurs in the San Sabastian mine, in Jalisco, and has been worked for a number of years; a body of cobalt ore in the neighboring Mirador mine, near Ameca, has only been recently identified. The wall rock is blue quartz, very hard and tough, showing some minute crystals of pyrite, and would not attract attention in any way. Analyses show it to contain about 98 per cent. of silica, from 0.4 to 0.5 per cent. of iron, and 0.42 to 0.55 per cent. of cobalt, the iron and cobalt being both present as sulphides but not associated with each other. By roasting with 0.5 per cent. of salt and leaching with hot water all the cobalt goes into solution, from which it is precipitated by sodium or ammonium sulphide. The sulphide is worth nearly $1.00 per pound of contained cobalt, making the gross value of the ore about $9.50 per ton. The wall rock carries no nickel, copper or gold, while the vein rock itself carries no cobalt. It is doubtful that the deposit will be worked for cobalt. J. W. RICHARDS.

Mining Industries in Spain. By H. L. GEISSEL. *Min. and Met.*, October 1, 1901.—The mineral output of Spain for 1899 was valued at $33,430,000; iron, coal and copper are the most important, followed by lead, zinc, mercury, manganese, sulphur, and salt. The principal lead smelting works are at Linàres and San Martin. The iron industry centers in the two northern provinces, Vizcaya and Santander; all the deposits are worked in open cuts; almost all of it is exported, about three-quarters to England and one-quarter to Germany. There were produced, in 1900, 91,586 tons of Bessemer ingots and 59,048 tons of open-hearth steel. The article then describes the mines and smelting plants at Bilboa and vicinity, with good illustrations. The coal industry is still in an undeveloped state, 2,770,000 tons being mined, and about 2,000,000 tons of coal and coke imported, chiefly from Great Britain and France. The copper industry centers about the province of Huelva; the Rio Tinto Company produced 35,732 tons in 1900. New deposits are being opened in Santander, Palencia, and Sevilla. The quicksilver output was

Digitized by Google

32,237 flasks in 1900, a decrease of 7,127 flasks from 1899. This output is one-half of the world's production. Zinc ore and manganese ore likewise fell off in production, in 1900. There is a large field in Spain for American machinery.

J. W. RICHARDS.

Mining Conditions and Mineral Resources in Brazil. *Eng. Min. J.*, 72, 428.—Information obtained from Dr. Medrado, engineer in charge of the Brazilian exhibit of its mineral resources at the Pan-American Exposition, describes the occurrence of gold, iron, manganese, graphite, cinnabar, mica and precious stones,—all very briefly. The capital employed is mostly English and Belgian; the laborers Spaniards, Brazilians and Italians. No statistics are given. J. W. RICHARDS.

The Morro Velho Gold Mine, Brazil. *Eng. Min. J.*, October 19, 1901.—The mine is owned by a British company—The St. John del Rey Gold Mining Co.—and is at present the great gold mine of Brazil and one of the great gold mines of the world. The yearly output has reached over $1,500,000. The ore is crushed very fine in a large 120-stamp mill. The residues from the amalgamation barrels are treated by the "oxygen process," which has been developed by experimenting on these ores, and is patented by Wilder and Chalmers, the former being the company's reduction superintendent. It is stated that this process has proved better than the cyanide process or chlorination, but no details are given. J. W. RICHARDS.

Mining in British Columbia. BY WM. B. BREWER. *Eng. Min. J.*, October 19, 1901; *Canadian Suppl.*—A lengthy description of the Atlin Mining District, mining on Boulder, Pine and Spruce Creeks, and at Munro Mountain, contains nothing new in the metallurgical line; will interest gold miners.

J. W. RICHARDS.

The Mineral Resources of New South Wales. BY T. A. RICKARD. *Eng. Min. J.*, October 19, 1901.—A review of E. F. Pittman's recent report, issued by the Geological Survey of that colony, contains an account of the extent, localities and geological occurrences of the metals, metalliferous minerals and non-metalliferous minerals found there. J. W. RICHARDS.

The Copper Mines of Ashio, Japan. BY E. G. ADAMS, JR. *Eng. Mag.*, October, 1901, p. 69.—Japan stands fifth among the nations in the production of copper; about one-third of the Japanese output comes from Ashio mines, situated ten miles south of Nikko, which is ninety miles from Tokio. The ore is mainly sulphide, and averages nineteen per cent. of metal. The reduction process is roasting, smelting in water-jacketed furnaces, and Bessemerizing of the black copper. The average wages paid is

Digitized by Google

13 cents, silver, per day; women sorting ore receive 7 cents, furnace and shaft men up to 30 cents. Eighty per cent. of the product is exported. J. W. RICHARDS.

Mining Conditions in the Transvaal. BY SPECIAL CORRESPONDENT. *Eng. Min. J.*, 72, 429.—A few of the representative mines are working in a half-hearted way. The present pay, $1.25 per day, attracts only the least efficient labor; laborers refusing to work at that rate are arrested and put over the border. The prevailing feeling is that prosperity and a new population will soon arrive. Bore-holes almost 5,000 feet deep at the Turf Club borings struck the reef at that depth, assays averaging 9 dwt. These results prove the productiveness of an enormous tract of country, and shafts of 10,000 feet are among the future possibilities. J. W. RICHARDS.

Assaying Complex Gold Ores. *Min. and Met.*, October 1, 1901; from *J. Soc. Chem. Ind.*, August 31, 1901.—Author dwells on necessity of employing different methods for different ores. *Basic oxidized ores* should be treated by direct fusion, with special attention to the proportion of charcoal and to metallic iron, if required. *Pyritic ores* (mainly iron pyrites) are roasted, and then fused as basic ores; or may be fused direct with addition of iron if they contain 30 per cent. or less of pyritic material. Oxidation with niter is satisfactory only with small quantities of pyritic material present. *Arsenical ores* are roasted and then fused like basic ores. *Antimonial ores* are best oxidized partially or completely by niter. *Cupriferous ores*, if rich in copper, are treated by combined wet and dry methods; if poor, by fusion, either direct or after roasting, special attention being given to the amount of litharge used; if rich in gold, scorification direct. *Lead ores* carrying galena are fused with iron; roasting is not recommended when much galena is present. *Zinc ores* carrying blende are carefully roasted and fused as basic ores, but with more flux, varied according to the amount of zinc present. *Telluride ores* are to be fused direct with very large proportions of lead oxide and ordinary fluxes, scorification being never employed. *Bismuth ores* are fused direct as basic ores; scorification is unsatisfactory if much bismuth is present. Poor ores are, in general, best assayed by making several independent fusions, and finally uniting the lead buttons, rather than by using methods of concentration. J. W. RICHARDS.

Proceedings of the International Association for Testing Materials. BY DR. RICHARD MOLDENKE. *Min. and Met.*, October 15, 1901.—Contains brief references to papers of Brinnell on determining hardness of metals by pressure from a hardened steel ball; of von Jüptner on the forms of carbon in iron; of Osmond,

Digitized by Google

on the metallography of metals under strain; of Heyn on the blistering effect of gases on iron and copper.

J. W. RICHARDS.

Some Suggestions as to Specifications for Steel Rails. By E. F. KENNEY, Engineer of Tests, P.R.R. *Eng. News*, **46**, 226.—Where phosphorus can be kept below 0.06 to 0.07 per cent., carbon can be raised to 0.55 or 0.65 per cent., but with phosphorus up to 0.10, the carbon must be kept at 0.40 to 0.50. Bessemer nickel-steel, with 3 per cent. nickel, 0.50 carbon, 0.094 phosphorus is costly, but gives splendid service under special conditions, as on a sharp grade and curve, with heavy tonnage and low speed. Present practice in making heavy rails does not give enough work in blooming; it is recommended that a rail of given weight should be made from an ingot of certain minimum size. It is recommended that excessive segregation be penalized, since the strength of the rail is only that of its weakest part. Recommends that rails be finished at a lower temperature than is now commonly used, microphotographs proving the finer grains thus obtainable. Suggests that instead of a certain finishing temperature being specified, it is better to specify the shrinkage allowance made between the saws in trimming off the hot rails, as, for instance, $5^1/_2$ inches in 30 feet. No rails should be straightened in the press if their irregularities exceed a certain amount, as flaws are often thus produced. Finally, the tests should be made on a rail from a definite part of the ingot, preferably the poorest, in order to insure all the rails of a run being within the requirements.

J. W. RICHARDS.

The Industrial Applications of Nickel Steel. By C. E. GUILLAUME. *Eng. Mag.*, October, 1901, p. 79.—The industrial characteristics of these alloys are tenacity (85,000 to 142,000 lbs. per square inch) combined with remarkable elongation (60 to 100 per cent.), enabling them to stand, without injury, deformations under which other steels would certainly show ruptures. Combined with this is a fairly high elastic limit. The magnetism of these alloys is variable, and changes with the temperature, suggesting their use as magnetic indicators of temperature changes. An automatic circuit-breaker acting on this principle is shown. The expansion by heat decreases rapidly as nickel increases; the alloy with 36 per cent. nickel expands 0.000001 per 1° C., which is only one-tenth the coefficient of platinum and one-thirteenth that of iron or nickel. These properties suggest extended use for pendulums, measuring rods, chronometers, etc. These alloys also resist corrosion better than ordinary steel, which increases their adaptability for boilers, marine purposes, structural purposes. The use for armor plates and forgings is also described.

J. W. RICHARDS.

Digitized by Google

The Effect upon Steel of Work at Different Temperatures. By C. H. RIDSDALE. *Eng. News*, **46**, 238, 276. An explanation based on the varying hardness of the grains of pure iron and the matrix of alloyed iron, at different temperatures. Above 1000° C. the grains are harder than the matrix; just below 1000° their hardness is about equal, and the steel rolls most uniformly; below a red heat the matrix is harder than the grains. To a certain point, the hotter the finishing-point the softer the material; the ideal finishing-point is that at which these two tendencies are properly balanced. There should be sufficient work at a sufficiently low temperature to well knead the material and reduce its grain, thus making it tough, but it must also be finished at a sufficiently high temperature to avoid inducing brittleness or undue rolling hardness. In general, 850° to 900° C. is too high, and below 600° to 700°, low red, is too low. Heavy rails are generally finished too high; light flange rails too low. The writer discusses at length the proper treatment for ingots, bars, girders, plates; the questions of re-heating, welding, forging; the treatment of plates and wire in galvanizing and tinning. The details are very interesting, but cannot be well reproduced in abstract. J. W. RICHARDS.

Jupiter Steel. By ANDRES G. LUNDIN. *Sci. Am.*, October 12, 1901.—This steel is being made at the plant of the U. S. Steel Co., at West Everett, Mass. Open-hearth furnaces with a capacity of 25 tons are used. Steel scrap is heated in the furnace to the boiling-point (?), then is added $1\frac{1}{2}$ to $2\frac{1}{2}$ per cent. of 12 per cent. ferrosilicon; when this is well mixed, 0.1 to 0.5 per cent. of 80 per cent. ferromanganese mixed with 3 per cent. of aluminum, more or less, is put in. The bath is stirred and poured. Tests are claimed showing 67,300 lbs. tensile strength and 25 per cent. elongation in 8 inches. The loose description of the process of manufacture given in this paper would lead one to expect phenomenally bad results instead of extra good ones, as claimed. J. W. RICHARDS.

The Steel Works at Sault Ste. Marie. *Eng. Min. J.*, October 19, 1901; *Canadian Suppl.*—It will cost $1.97 freight to bring Connellsville coke to this plant, to smelt one ton of pig iron; the total cost of assembling the materials will, therefore, be less than at Pittsburg. Two large blast-furnaces are being built, and the pig iron will be converted directly in two 5-ton acid lined Bessemer converters. Gas engines of the Cockerill type will be used to provide blast, the first installation of its kind in America. J. W. RICHARDS.

The Influence of Copper in Steel Wire. By J. E. STEAD AND F. H. WIGHAM. *Eng. Min. J.*, 72, 423.—Extract of paper read before the International Eng. Congress at Glasgow. Experi-

Digitized by Google

ments with 0.04 to 2 per cent. of copper in Bessemer and crucible steel. These amounts of copper have, in general, a deteriorating influence, particularly in high carbon steel; the only property improved is that of resistance to corrosion. J. W. RICHARDS.

The Commercial Preparation of Vanadium and Uranium Compounds from Carnotite. BY DR. J. OHLY. *Min. and Met.*, October 1, 1901.—The ores occur in San Miquel, Montrose and Dolores Counties, Colorado. It is crushed to 30 mesh, mixed with 20 per cent. common salt, and roasted at 700° C. for thirty minutes. The mass is then leached with distilled water, and a calculated amount of caustic soda added to the strong solution of sodium vanadate, precipitating white alkaline vanadates of the formulae $(K,Na)_3.VO_4.nH_2O$. This is filtered out, dissolved in dilute HNO_3 and hydrated V_2O_5 precipitated by ammonia. This oxide is dried, and forms commercial "vanadic acid," selling for $9 per pound. It is used mostly for producing vanadium alloys for steel. Cowper-Cowles proposes to produce the metal by direct electrolysis of the alkaline vanadate solution. The alkaline uranates formed during roasting are insoluble in the strong salt solution produced in leaching. The residue is, therefore, treated with a calculated amount of dilute sulphuric acid, sufficient to decompose these salts, in steam heated vats. Absence of yellow specks in the residue indicates complete solution of the uranium. The solution is removed, neutralized with sodium carbonate and boiled half an hour, precipitating Fe, Al, Ca, Mg. The filtered solution is precipitated by a calculated amount of caustic soda solution, giving $Na_2U_2O_7.H_2O$, which is filtered out and washed. The commercial salt thus produced contains 85.6 per cent. $Na_2U_2O_7$, with 3.2 per cent. Na_2CO_3, 7.5 per cent. H_2O, 1.8 per cent. Al_2O_3, 1.9 per cent. SiO_2 and only a trace of V_2O_5. The precipitated iron oxides, etc., mixed with five-fourths their weight of sand and dried, form artificial fuller's earth, commanding $12 per ton. The methods above given can be satisfactorily employed in the laboratory for quantitative estimation of U and V. The ore is mixed with 20 per cent. of NaCl, roasted half an hour, cooled, covered with cold distilled water, filtered, and strong NaOH solution added, precipitating the vanadate. Filter, dissolve in strong HNO_3, add NH_4OH in excess, wash with strong NH_4OH, dry, ignite as V_2O_5. Treat residue with dilute H_2SO_4, evaporate to dryness, take up with dilute H_2SO_4, filter, add excess Na_2CO_3, boil five minutes, filter, mix with NaOH. The precipitated sodium uranate is filtered out, dissolved in HNO_3 and re-precipitated by NH_4OH in slight excess. Filter, wash with dilute NH_4OH, heat in open platinum crucible, and weigh as the green U_3O_8.

J. W. RICHARDS.

Copper Precipitation. *Min. and Met.*, October 1, 1901.—The mine waters flowing from the copper mines of Butte contain

Digitized by Google

over $3,000,000 worth of copper annually. The copper sulphate is very corrosive to mine tools, pumps, etc. It is precipitated by scrap iron, in rows of vats, eight feet deep and twelve feet wide. Twenty-five tons of scrap iron, costing $5 per ton, are used daily, precipitating 10,000 tons of copper yearly. At the Rio Tinto mines in Spain a similar solution is made artificially by roasting low grade pyritous ore. J. W. RICHARDS.

The Commercial Importance of Aluminum. BY PROF. E. WILSON. *Age of Steel*, October 26, 1901.—Paper read at Glasgow before the Mechanical Science Section of the British Association, states the output for 1900 as 5,000 tons, from 25,000 horse-power. The purest commercial metal now contains 99.6 per cent. aluminum. Weight for weight it has double the electric conductivity of copper, and is being largely used for conductors; screwed socket joints are the most successful. Numerous instances of its successful use for power transmission are given. Large quantities are used for rendering steel more fluid in the ladle and preventing blowholes in ingots; two ounces to two pounds is used per ton of steel. Leaf aluminum has replaced leaf silver for decorative purposes. J. W. RICHARDS.

A New Aluminum Plant. *Eng. Min. J.*, October 12, 1901.—The new Canadian plant of the Pittsburgh Reduction Company, begun about two years ago on the St. Maurice river, eighteen miles above Three Rivers, is ready for operation. Ten thousand horse-power is installed, and will manufacture ten tons of aluminum daily, which will be almost entirely exported. The plant has cost about $1,000,000. A large rolling mill will be erected. J. W. RICHARDS.

Aluminum in Yellow Brass. *The Al. World*, October, 1901.—Aluminum is an exceptionally useful ingredient in yellow brass, provided there is but little tin present. Larger gates must be employed; the metal runs more freely and the castings are cleaner and sounder. It is not a useful ingredient for brass intended for rolling, but is very satisfactory for sand castings. J. W. RICHARDS.

Electrochemical and Electrometallurgical Industry. BY JOHN B. C. KERSHAW. *Elec. Rev.* (N.Y.), October 12 and 26, 1901.—ART. I: *Progress in the United States. Copper Refining:*—Eight refineries now exist, at Baltimore, Newark, Great Falls, Anaconda, Bridgeport, Brooklyn, Salt Lake City, Perth Amboy. Great Falls uses water power; the rest steam. 211,000 tons of copper are refined yearly. *Aluminum.*—In 1900, 3,190 tons were made by the Hall process, at Niagara Falls, using 10,000 horse-power. A large portion of this metal is used for electrical transmission lines which have so far given satisfaction. *Alkali and Chlorine.*—The Le Sueur process is used at Berlin Falls, Me.,

Digitized by Google

using 700 horse-power, the products being utilized locally by the Burgess Sulphite Fiber Co. The Castner Electrolytic Alkali Co., at Niagara Falls, use 2,000 horse-power and are putting down 4,000 horse-power additional. *Calcium Carbide* is made at Niagara Falls, Sault Ste. Marie, and Appleton, Canada. About 10,000 horse-power is used in its manufacture. *Chlorates* are made at Niagara Falls and Bay City, using 3,000 horse-power. *Nickel* has been electrolytically refined at Newark since 1894.

ART. II. *Progress in the United Kingdom. Copper Refining*:—All the European refineries have plant in excess of their needs, because of the withdrawal of American supplies of crude copper. The refineries in Great Britain have a capacity of 25,000 tons yearly, but do not reach that output. *Aluminum:*—The British Aluminum Co., at Foyers, Scotland, has 14,000 horse-power available, of which 5,000 is being utilized, but the supply exceeds the demand. *Alkali and Chlorine:*—The Weston Point works of the Castner-Kellner Alkali Co., have 4,000 horse-power; the Middlewich works of the Electrolytic Alkali Co., using the Hargreaves-Bird diaphragm process, have 800 horse-power in operation. *Calcium Carbide*, is produced under the Willson patents, at Foyers, producing, in 1900, 1,200 tons, using 1,200 horse-power. *Sodium* is produced by the Castner process, at Weston Point. *Electrozincing* is carried on commercially at several works.

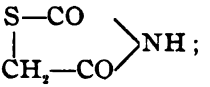
J. W. RICHARDS.

ORGANIC CHEMISTRY.

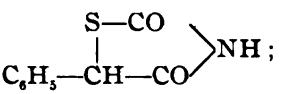
Researches on Thiocyanates and Isothiocyanates. BY HENRY L. WHEELER. *Am. Chem. J.*, **26**, 345–360.—The first product of the action of alkyl halides upon KSCN or AmSCN is a normal thiocyanate; with acylhalides, it is an isothiocyanate. So far as observed, replacement of one H of methyl chloride by the —CO.R group (R = — Oalk, —NXY, —CH_3, —C_6H_5, —C_4H_3S thienyl) does not produce conditions favorable to the formation of isothiocyanates. The present paper deals with compounds in which two or more H's of methyl chloride have been replaced by negative groups, using diethylchlormalonate, $ClCH(COOC_2H_5)_2$, and tricarbethoxychlormethane, $ClC(COOC_2H_5)_3$. With KSCN, the former of these gives a normal thiocyanate; with the latter there is practically no reaction at all. Diethyl ethylchlormalonate, $ClC(C_2H_5)(COOC_2H_5)_2$, likewise refused to react with KSCN in alcoholic solution. The effect of the presence of negative phenyl groups was examined, using ethyl phenylchloracetate, $ClCH(C_6H_5)COOC_2H_5$, diphenylmethylbromide, $(C_6H_5)_2CHBr$, and triphenylmethylbromide, $(C_6H_5)_3CBr$. With alcoholic AmSCN, the first of these gives a normal thiocyanate; the second, boiled with KSCN in benzene solution, yields an isothiocyanate, but with AmSCN at ordinary temperatures gives a

Digitized by Google

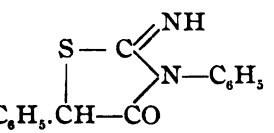
normal thiocyanate, which changes to the iso upon heating; the third forms a normal thiocyanate. Of the four halides above, which form thiocyanates, the least negative (or, most positive) yields the isothiocyanate with ease, while the others do not, a result in direct opposition to the statement of Michael (*Am. Chem. J.*, **14**, 486 (1892)) that such a rearrangement takes place with greater difficulty the more positive the radical in union with the SCN group. The results of the work indicate that the tendency to form isothiocyanates is not proportional to the negative nature of the radicals, and that at present it is impossible to predict in new cases whether an alkyl thiocyanate will suffer rearrangement or not. *Diethylthiocyanmalonate*, $NCSCH(COOEt)_2$. —From diethyl chlormalonate and KSCN in alcoholic solution. Colorless oil, very little odor; b. p., 169°–170° at 22–23 mm. Evaporated with conc. HCl and the residue crystallized from water, large colorless transparent 4-sided tables are obtained, of *α-μ-diketotetrahydrothiazole*,



melting-point, 125°–126°. *Diethylmalonate Derivative of Benzoyldithiocarbamic Acid*, $C_6H_5CONHCSSCH(COOEt)_2$. — From the preceding thiocyanate and thiobenzoic acid in benzene solution. Crystallizes from alcohol in long, bright yellow flat prisms or plates; melting-point, 119°. *Ethylphenylchloracetate*, $ClCH(C_6H_5)COOEt$.—From phenylchloracetylchloride and alcohol. Colorless oil of pleasant fruity odor, whose vapor slightly irritates the eyes; b. p., 142° at 17–18 mm. *Ethylphenylthiocyanacetate*, $NCSCH(C_6H_5)COOEt$.—From the above halide and alcoholic AmSCN. Oil; b. p., 182°–184° at 17 mm. Evaporated to dryness with conc. HCl and residue crystallized from alcohol, beautiful colorless prisms are obtained of *α-μ-diketo-β-phenyltetrahydrothiazole*,



m. p., 125°–126°. Easily soluble in alcohol, difficultly in water, soluble in dilute alkali. *Diphenylpseudothiohydantoin*.—From the preceding thiocyanate and aniline. Plates



(from alcohol); m. p., 185°–186°. Insoluble in cold alkali, easily soluble on warming. *Ethylphenylacetate Derivative of Benzoylthiocarbamic Acid*, $C_6H_5CONHCSSCH(C_6H_5)COOEt$.—

Digitized by Google

From ethylphenyl thiocyanacetate and thiobenzoic acid, heated together in benzene solution. Thin yellow plates; m. p., 150°–154°. Easily soluble in alcohol. *Diphenylmethylisothiocyanate*, $(C_6H_5)_2CHNCS$.—By boiling a benzene solution of the corresponding bromide with finely pulverized KSCN or AmSCN. Beautiful colorless prisms (from alcohol); m. p., 61°; b. p., 222°–225° at 37–38 mm. When an ether solution of the bromide, free from alcohol, remains for several days in contact with KSCN, the product is an oil consisting mainly of the *Normal thiocyanate*. *Diphenylmethylacetamide*, $CH_3CONHCH(C_6H_5)_2$. From the above isothiocyanate warmed with thioacetic acid in benzene solution. Colorless needles (from dilute alcohol); m. p., 146°–147°. Easily soluble in strong alcohol, crystallizing out in compact prisms. Readily saponified by warming with conc. HCl. *Diphenylmethylbenzamide*, prepared in a similar manner, crystallizes from alcohol in colorless silky needles; m. p., 166°–167°. Cannot readily be saponified either by boiling with alkali or with alcoholic or conc. aqueous HCl. *Diphenylmethylthiourea*, $(C_6H_5)_2CHNHCSNH_2$.—From the isothiocyanate and alcoholic ammonia. Beautiful long colorless silky needles; m. p., 189°. Easily soluble in hot alcohol. *Diphenylmethyl Methylthiourea*, $(C_6H_5)_2CHNHCSNH(CH_3)$.—From the isothiocyanate and alcoholic methylamine. Flat colorless prisms; m. p., about 152°. Easily soluble in alcohol. *Diphenylmethyl Diethylthiourea*, $(C_6H_5)_2CHNHCSN(C_2H_5)_2$.—From the isothiocyanate and diethylamine. Colorless needles; m. p., 112°–113°. Readily soluble in hot alcohol. *Diphenylmethyl Diisobutylthiourea.*—Long colorless needles (from alcohol); m. p., 97°–98°. Insoluble in alkali. *Diphenylmethyl Phenylthiourea.*—Very difficultly soluble in alcohol; may be crystallized from a mixture of toluene and ethyl benzoate and then from glacial acetic acid. Sandy powder, apparently composed of small compact colorless prisms; m. p., 178°. *Diphenylmethyl Methylphenylthiourea*, $(C_6H_5)_2CHNHCSN(CH_3)(C_6H_5)$. Beautiful long slender colorless needles (from alcohol); m. p., 119°–120°. *Diphenylmethyl β-Naphthylthiourea.* Colorless needles; m. p., 179°. *Diphenylmethyl Phenylthiosemicarbazide*, $(C_6H_5)_2CHNHCSN(C_6H_5)NH_2$.—From the isothiocyanate and phenylhydrazine in alcoholic solution. Difficultly soluble in alcohol, but crystallizes from a mixture of alcohol and ethyl benzoate in colorless plates; m. p., 178°, but after melting at this temperature it resolidifies in a few seconds and then melts at 198° with effervescence and decomposition, a change of behavior probably due to a molecular rearrangement. *Triphenylmethylthiolacetate*, $CH_3COSC(C_6H_5)_3$.—From triphenylmethylthiocyanate heated with thioacetic acid in benzene solution. Beautiful colorless twinned prisms (from alcohol); m. p., 138°–140°. *Triphenylmethylthiolbenzoate.*—Prepared in similar manner to last, or from triphenylmethylbromide and potassium thiolbenzoate. Colorless

Digitized by Google

prisms (from a mixture of benzene and chloroform); m. p., 184°–185°. Difficultly soluble in alcohol, readily in benzene. *Triphenylmethylthiocyanate and Ammonia.*—The thiocyanate was dissolved in benzene, excess of alcoholic ammonia added, mixture allowed to stand for three days, then evaporated dry and residue extracted with hot water. From this aqueous extract, triphenylmethylcarbinol (m. p., 159°) was separated. Portion insoluble in water was dissolved in benzene and saturated with HCl gas, when triphenylmethylamine chloride was obtained in small plates; m. p., 244°; in the mother-liquor was found triphenylmethylethyl ether, which crystallized from alcohol in beautiful stout prisms; m. p., 83°–84°. No evidence whatever was obtained of the formation of any thiourea derivative. When *aniline* was used instead of ammonia, a mixture of substances resulted, from which phenylthiourea was the only substance isolated in a state of purity. The thiocyanate, when warmed with *phenylhydrazine* in alcoholic solution, gave colorless prisms, melting with effervescence at 201°, and in their percentage of nitrogen corresponding with the formula for *phenylthiosemicarbazide.* The unstable triphenylmethanehydrazobenzene, described by Gomberg, also appears to be formed in the reaction. In one experiment, crystals were obtained like those of phenylthiosemicarbazide, but which melted constantly at 137° with effervescence. The amount of nitrogen found in these crystals corresponded with the theory for triphenylmethylphenylthiosemicarbazide, but Dr. Wheeler believes them to have been a mixture. The reactions of triphenylmethylthiocyanate appear to leave little doubt that it is a normal thiocyanate, while diphenylmethylbromide gives an isothiocyanate. Benzoylisothiocyanate reacts with sodium malonic ester, sodium formanilide, sodium phenolate, and sodium acetoacetic ester like an acyl halide, the isothiocyanogen group being removed as NaSCN. Benzoyl rhodanide, in presence of aluminum chloride reacts with toluene, giving a compound which crystallizes from alcohol in red prisms, soluble in alkali; m. p., 135°–136°, the percentage of nitrogen present agreeing with the formula $CH_3.C_6H_4.CSNHCOC_6H_5$. Using phenetol, instead of toluene, *p-ethoxythiobenzamide* was obtained, crystallizing from benzene in plates; m. p., 158°. Benzoylisothiocyanate also combines with phosphine, apparently with the production of a *Phosphourea*, $C_6H_5CONHCSPH_2$, which separated as an orange precipitate, soluble in alkali with a red color, readily soluble in alcohol, difficultly in benzene (m. p. 155–157). M. T. BOGERT.

Phenoxozone Derivatives. BY H. W. HILLYER. *Am. Chem. J.*, **26**, 361–372. — The author has previously shown that the interaction of one molecule picryl chloride, one molecule pyrocatechin, and two molecules sodium ethoxide, at 60°–70° C., gives dinitrophenoxozone. Alcoholic sodium hydroxide may be

Digitized by Google

used instead of ethoxide, and the amount of alcohol used as solvent be diminished, without greatly affecting the yield. For crystallization of the product, acetone is a better solvent than glacial acetic acid or benzene. By the action of zinc dust and glacial acetic acid a color base was obtained, whose chloride is not decomposed by water, while its acetate is hydrolyzed in such fashion as to permit of the free base being collected with ether. Its oxidized acetic solution dyes silk a dove color. By combination with diazosulphanilic acid and subsequent treatment with sodium hydroxide and sodium chloride, a brick-red precipitate resulted, difficultly soluble in cold water, quite easily in hot. Its solutions dye silk brown. *Diamidophenoxozone.*—By reduction of the dinitro body with tin and hydrochloric acid. Thin white or light pink needles, which pack together like felt; melt with blackening at 198°–200°. Diazotizes with difficulty, sodium nitrite with its acid solutions giving a dye like Bismarck brown. Auric chloride gives a greenish precipitate which decomposes on warming. Hydrochloroplatinic acid, in presence of water, gives a salt containing one molecule of base to one of acid; in absolute alcoholic solution, a salt results with two molecules of the acid to one of the base. *Diacetyldiaminophenoxozone.*—By the action of glacial acetic acid upon the diamino body. Crystallizes from a mixture of ethyl acetate and little alcohol in small pearly-white glistening scales, which melt, with blackening, at 252.5°–253°. Heated with dilute sulphuric acid, and product recrystallized, radial masses of slender needles separated, of pale pink color. *Dibenzoyldiaminophenoxozone.*—Prepared by the Schotten-Baumann reaction. White powder, not perceptibly soluble in boiling benzene, toluene, ether, petroleum ether, ethyl acetate, or alcohol; slightly soluble in boiling amyl alcohol; best crystallized from nitrobenzene; m. p., 274°–275°. *Action of alkali upon dinitrophenoxozone.*—From solution in alcoholic sodium ethoxide, acids reprecipitate it unchanged. Warmed with aqueous alcoholic sodium hydroxide, it dissolves with formation of *dihydroxydinitrophenoxide*, $HO.C_6H_4.O.C_6H_2(NO_2)_2(OH)$, which separates as a light-yellow crystalline precipitate upon solidifying; m. p., 153°–153.5°. It is very little soluble in cold water, and but sparingly so in hot; slightly soluble in cold 50 per cent. alcohol, freely in hot. Aqueous solutions slowly redden blue litmus. It dissolves slowly in cold sodium carbonate solution, more rapidly when heated (with evolution of CO_2). It is slowly soluble in sodium acetate solution, with yellow color. Its alkaline solution is reprecipitated by hydrochloric but not by acetic acid. Its ammonium salt crystallizes in long yellow needles. By treatment of dihydroxydinitrophenoxide with strong sodium hydroxide, three kinds of crystals were obtained: (1) garnet-red rhombic crystals of the color of potassium ferricyanide; (2) stout, light orange crystals or needles, apparently monoclinic; (3) ruby crys-

Digitized by Google

tals. Orange crystals were found to be the monosodium salt; ruby crystals, the disodium salt with three molecules of water of crystallization; while the garnet crystals were apparently the same as the ruby ones, possibly with an admixture of some of the monosodium salt. The disodium salt loses one molecule of water *in vacuo* over sulphuric acid; the other two molecules escape at 110°–115°. The mono-argentic salt forms a yellow powder, which changes to a brilliant scarlet upon drying. Zinc oxide and the dihydroxy compound mutually dissolve in presence of water, forming an orange solution. *Dimethylether* was obtained by the action of silver oxide and methyl iodide upon the benzene solution of the dihydroxy body; m. p., 119°–120°. Soluble in alcohol; insoluble in cold dilute aqueous or alcoholic sodium hydroxide, but dissolves on heating. Reduction of dihydroxydinitrophenoxide by tin and hydrochloric acid yielded a base whose chloride formed a light violet mass. No condensation products could be obtained by the action of alcoholic alkali upon the following mixtures: (1) picryl chloride and alizarin, (2) nitroparadibrombenzene and pyrocatechin, (3) 2,4-dinitrobrombenzene and pyrocatechin. In the latter case, considerable ethyl ether of the dinitrophenol resulted. With nitropyrocatechin (OH,OH,NO_2:1,2,3), however, a condensation product was separated in yellow crystals. *Condensations with pyrogallol* (with R. D. Hall).—By the action of sodium ethoxide upon an absolute alcoholic solution of pyrogallol and picryl chloride, *hydroxydinitrophenoxozone*, $HO.C_6H_3.O_2.C_6H_2(NO_2)_2$, was obtained, melting at 258°–258.5°. It separates from acetone as a light yellow powder; from acetic acid, in broad, brown transparent spikes, united in tufts. Insoluble in cold water, sparingly soluble in hot water, benzene or ether; more soluble in absolute alcohol, phenol or ethyl acetate; easily soluble in nitrobenzene, glacial acetic acid, or acetone. Dissolves in dilute alkalies and is reprecipitated unchanged by acids; strong alkalies decompose it. If alcoholic ammonia be used to effect the condensation, instead of sodium ethoxide, picramide and tarry bodies result. In the pyrogallol condensation, a phenol-like body is also formed, possibly a *trihydroxydinitrophenoxide*, which dissolves in alkalies and is reprecipitated by hydrochloric or sulphuric acids but not by acetic acid. By reduction of hydroxydinitrophenoxozone with tin and hydrochloric acid a base is obtained, which crystallizes in fine needles, m. p., 252°–253°, and which dissolves in alkalies with decomposition. It is soluble in alcohol or acetone, but difficultly soluble in water or in the common organic solvents.

M. T. Bogert.

The Action of Benzoyl Chloride on Ammonium Sulphocyanate. By Gideon Benson and H. W. Hillyer. *Am. Chem. J.*, **26**, 373–377.—An attempt to prepare benzonitrile by

Digitized by Google

the action of heat upon dibenzoylthiourea obtained from benzoyl chloride and ammonium thiocyanate. The interaction of three molecules benzoyl chloride upon one molecule ammonium thiocyanate at 180°–200° C. yields benzonitrile, benzoic acid, COS and hydrochloric acid. In explanation of the course of this reaction, the following equations are given:

$$C_6H_5COCl + NH_4CNS = C_6H_5COCNS + NH_4Cl,$$
$$C_6H_5COCl + NH_4Cl = C_6H_5CN + H_2O + 2HCl,$$
$$C_6H_5COCNS = C_6H_5CN + COS,$$
$$C_6H_5COCl + H_2O = C_6H_5COOH + HCl,$$

or,

$$C_6H_5COCl + NH_4CNS = C_6H_5CONH_2 + HCl + HCNS,$$
$$C_6H_5COCl + HCNS = C_6H_5COCNS + HCl,$$
$$C_6H_5COCNS = C_6H_5CN + COS,$$
$$C_6H_5CONH_2 + C_6H_5COCl = C_6H_5CN + C_6H_5COOH + HCl,$$

both of which series may be summarized as follows:

$$3C_6H_5COCl + NH_4CNS = 2C_6H_5CN + C_6H_5COOH + 3HCl + COS.$$

The correctness of this summarized equation was verified by carrying the reaction through quantitatively. The yield of benzonitrile by this process amounts to 38 per cent. of the benzoyl chloride used. As compared with the well-known methods of Fehling, Letts, and Henry, there appears to be but little choice between the four, both as to yield of benzonitrile and as to price and availability of initial materials. M. T. BOGERT.

BIOLOGICAL CHEMISTRY.

Observations on the Digestion of Proteids with Papain. BY LAFAYETTE B. MENDEL AND FRANK P. UNDERHILL. *Trans. Conn. Acad. Arts and Sci.*, 1901, 11, 1–17.—All types of animal proteids were subjected to the action of the commercial preparations of papaïn, known as "papaïn" (Lehn & Fink), "papaïn," (Merck), "caroid," and "papoid." The experiments were made in alkaline, acid and neutral media, and under various other conditions. The results indicate that papaïn belongs to a class of enzymes which differs somewhat in type from the two proteolytic enzymes—pepsin and trypsin. While the products of papaïn digestion of proteids resemble closely those of pepsin so far as these have been examined in detail, the enzyme differs from ordinary animal pepsin, in that it acts readily in both neutral and alkaline media. On the other hand, although papaïn is comparable with trypsin in exerting a solvent action in fluids of various reactions, the failure to form leucin, tyrosin and tryptophan places it in a class of its own. F. P. UNDERHILL.

Digitized by Google

Do Spermatozoa Contain Enzymes Having the Power of Causing Development of Mature Ova? By WILLIAM J. GIES. *Am. J. Physiol.*, 6, 53–76.—Mature ova of Arbacia, when subjected under various conditions to the action of spermatozoa extracts, which have been made by the ordinary methods for the preparation of enzyme solutions, do not undergo any proliferation. No evidence can be furnished of the existence of a zymogen in spermatozoa. Extracts of fertilized eggs seem likewise to be devoid of any segmental activity. The extracts do not produce the typical peripheral "vitelline" membrane always formed immediately in Arbacia eggs on fusion of the male and female elements. The results do not show that enzyme action is impossible after, or at the time of union of the spermatozoon with the ovum within the latter, although some of the results suggest that enzymes are not thus elaborated.

F. P. UNDERHILL.

A Method for the Differential Modification of the Proteids in Percentage Milk Mixtures. By THOMPSON S. WESTCOTT. *Am. J. Med. Sci.*, 122, 439.—The method, which is reduced to mathematical terms, is based upon the different relation of lactalbumin to caseinogen in human and cow's milk, and gives a means of making from cow's milk a milk mixture which is very similar to human milk. It consists in mixing in definite proportions (given in a table), cream, whole milk, fat-free whey, and a diluent, or in mixing various combinations of two or three of these fluids, to which is to be added sugar of milk in amount necessary to bring up the required sugar percentage. The most important feature of this method is in the addition of whey, which gives the needed increase in lactalbumin without changing the proportion of caseinogen. F. P. UNDERHILL.

On the So-Called Gluten and Diabetic Foods of Commerce. By H. C. SHERMAN AND H. M. BURR. *N. Y. Med. J.*, 74, 686.—The samples of the commercial glutens analyzed were obtained either from the retail market or directly from the manufacturers. In each case it was implied by the latter that the goods had been largely freed from starch and for this reason were specifically recommended for diabetic patients. The samples were analyzed for moisture, fat, protein, ash, carbohydrates and fiber. For moisture, fat, protein, ash and fiber the methods of the official agricultural chemists were followed (*Bull.* 46, revised, *Div. Chem., U. S. Dept. Agr.*). The carbohydrates were determined "by difference." Starch was also directly determined as dextrose by the Allihn method, after digestion with saliva, as recommended by Chittenden (*Studies, Lab. Physiol. Chem., Yale*, 1888). Of the eleven samples examined, not one-half were noticeably higher in protein or lower in carbohydrates than ordinary whole wheat or Graham flour, and many were scarcely better

Digitized by Google

than ordinary white bread or flour. Only three samples showed any really material increase in the proportion of gluten, and all of these contained at least three-fourths as much carbohydrate as baker's bread. The best sample examined contained twice as much carbohydrate as protein. F. P. UNDERHILL.

The Composition of Tendon Mucoid. BY W. D. CUTTER AND WILLIAM J. GIES. *Am. J. Physiol.*, **6**, 155–173.—The mucoid was prepared from the Achilles tendon of the ox by the usual method of extracting with one-half saturated lime-water and precipitating with acetic acid. The extractions were made in fractions, purified and analyzed by the usual methods. By analysis it is shown that more than one glycoproteid is present in tendon. The average percentage composition of five preparations of the mixed mucoids was:

C.	H.	N.	S.	O.
48.04	6.67	12.49	2.20	30.62

The composition of mucoid from the shaft and sheath of the Achilles tendon:

	C.	H.	N.	S.	O.
Shaft.	47.56	6.61	12.34	1.95	31.52
Sheath.....	48.73	6.75	12.66	2.57	29.28

The average composition of mucoid from white fibrous connective tissue is very nearly the same as that of chondromucoid and osseomucoid. Thermochemical studies of mucoids in tendon, cartilage and bone, emphasize the probability that these bodies are very closely related. F. P. UNDERHILL.

Butyric and Acetic Acids in the Contents of the Stomach and Tests for Their Detection. BY MARK I. KNAPP, M.D., *N. Y. Med. Record*, **60**, 771–773.—The presence of butyric and acetic acids in stomach contents is an indication of fermentation. To detect: 1 cc. filtered gastric contents is shaken with 5 cc. ether in a separatory funnel and allowed to stand, after which the lower liquid is drawn off. To 2 cc. of distilled water is added one drop of 10 per cent. ferric chloride in a test-tube. The ethereal extract is allowed to float upon the iron solution, and at the juncture of the two liquids an orange-colored ring is seen if butyric acid is present. If acetic acid is present the ring has a rusty color. A few drops of alcohol will increase the intensity of these colorations. To differentiate between these rings, a little alcohol is added and the whole shaken. If the ring is due to butyric acid, the ether becomes orange-colored, but remains clear if due to acetic acid. Lactic acid, aldehyde, and acetone give similar rings, but in each case the color is different. F. P. UNDERHILL.

The Blood Count at High Altitudes. BY W. A. CAMPBELL AND H. W. HOAGLAND. *Am. J. Med. Sci.*, **122**, 654–664.—The blood count increases as one ascends (without exer-

Digitized by Google

tion) at the rate of 50,000 corpuscles per cubic centimeter per thousand feet. The pulse rate increases in the same ratio as the blood count. The increase in blood count is not a true multiplication of the blood corpuscles, but is due to a changed vasomotor condition in the peripheral vessels incident to diminished barometric pressure. The increase in blood count disappears as one returns to the altitude whence he started. The want of increase in haemoglobin is accounted for by the fact that the corpuscles are not increased at high altitudes at once. After remaining at a high altitude for some time the true increase in corpuscles takes place, and with it the increase in haemoglobin.

F. P. UNDERHILL.

On the Production of Artificial Parthenogenesis in Arbacia by the Use of Sea-Water Concentrated. BY S. J. HUNTER. *Am. J. Physiol.*, **6**, 177–181.—Sea-water that is condensed until it is isotonic with Loeb's 10 to 15 per cent. $2\frac{N}{2}$ sodium chloride solutions will cause artificial parthenogenesis in unfertilized Arbacia eggs. Sea-water with osmotic pressure perceptibly less or greater than the 10 to 15 per cent. solutions of $2\frac{N}{2}$ sodium chloride will not produce artificial parthenogenesis. These results tend to strengthen Loeb's osmotic theory of artificial parthenogenesis in Arbacia.

F. P. UNDERHILL.

Phlorhizin Diabetes in Cats. BY JULIUS F. ARTEAGA. *Am. J. Physiol.*, **6**, 173–177.—Subcutaneous injection of 0.1 gram of phlorhizin dissolved in 1.2 per cent. sodium carbonate at intervals of eight hours into the fasting animal, shows a progressively increasing effect on the part of the phlorhizin to cause elimination of sugar in the urine. The urinary ratio between sugar and nitrogen on the first day was 1.96 and on the fourth day 4.30. Subcutaneous injections of 1 gram every eight hours showed the urinary ratio, dextrose : nitrogen, 2.8 : 1, which ratio holds good for the goat and rabbit.

F. P. UNDERHILL.

PHARMACEUTICAL CHEMISTRY.

Sanguinaria Alkaloids. BY R. FISCHER. *Archiv. der Pharmazie*, **239**, 409.—The author separated at least four distinct crystallizable alkaloids, *viz*: chelerythrine, sanguinarine, protopine, and homochelidonine. Alcohol-free chelerythrine was recrystallized from toluene, the crystals melting at 257° and containing one molecule of toluene $(C_{21}H_{17}NO_4)_2,H_2O + C_6H_5CH_3$. The analyses of sanguinarine correspond to the formula $C_{20}H_{15}NO_4 + {}^1/_2C_2H_5OH$. Two bases of the formula $C_{21}H_{23}NO_5$, β- and γ-homochelidonine, were isolated, the former melting at 159° the latter at 169°. One could be changed into the other by use of different precipitants as well as temperatures. The change from γ- to β-homochelidonine was quantitative, the reverse only

Digitized by Google

partial. Protopine was identified by its melting-point, color reactions, analysis and crystallographic measurements.
J. O. SCHLOTTERBECK.

The Alkaloids of Eschscholtzia Californica. BY R. FISCHER. *Archiv der Pharmazie*, 239, 421.—No morphine was found as had been reported by Bardet and Adrian in 1888. By analyses, melting-point determinations, color reactions, and crystallographic measurements, protopine and β-homochelidonine were identified. The author believes that small quantities of chelerythrine and sanguinarine are also present but he did not isolate them.
J. O. SCHLOTTERBECK.

The Alkaloids of Glaucium Flavum. BY R. FISCHER. *Archiv. der Pharmazie*, 239, 426.—The author isolated glaucine and protopine in a pure state. The former was obtained in colorless crystals of the rhombic system, melting at 120°. Glaucine is a very weak monacid base, forming crystallizable salts with strong mineral acids. Platinum and gold chlorides are easily reduced in acid solution. It rotates polarized light to the right, $[\alpha]_D = 113.3°$. Its empirical formula was determined to be $C_{21}H_{25}NO_5$. It is a tertiary base containing four methoxyls. J. O. SCHLOTTERBECK.

The Lloyd Reaction for Morphine. BY JOSEPH L. MEYER. *Western Druggist*, 23, 483.—The famous morphine-hydrastine test, which figured so prominently in Lloyd's novel, "Stringtown on the Pike," is made the basis of a series of experiments upon twenty of the most common alkaloids found in the drug store. Only three, *viz.*, heroine, morphine, and veratrine, give the violet-blue color when one part of hydrastine, mixed with eight parts of the alkaloid to be tested, is stirred upon a white slab with a few drops of strong sulphuric acid for five minutes. The author concludes that Lloyd's reaction for morphine is worthy a place among the alkaloidal color tests. J. O. SCHLOTTERBECK.

SANITARY CHEMISTRY.

Sewage Filtration. Experiments with contact beds, receiving septic sewage, by the State Board of Health of Rhode Island in conjunction with the city engineer of Pawtucket. *Monthly Bulletin*, State Board of Health of Rhode Island, 1901, 13, 47–51.—The experiments were conducted on four beds. Beds numbered 14 and 15, were each about 15 feet square, underdrained at a depth of 4 feet. Beds numbered 16 and 17 were circular iron tanks, 6 feet in depth and having a diameter of 20 inches. Bed 14 was filled with broken stone, "chestnut size;" bed 15 with cinders, 1/8–1 inch in diameter; bed 16 broken coke, "egg size;" bed 17, cinders the same as bed 15. Beds 14 and 15 received septic sewage three times a day, the time of contact being four

Digitized by Google

hours, and were run at the rate of 527,000 gallons per acre per day; beds 16 and 17 received the effluent from bed 15 in four doses each day, thus acting as second contact beds, and were run at the rate of 800,000 gallons per acre per day, six days each week. The analyses given show only a partial purification, the effluent from bed 14 containing 0.5023 part of albuminoid ammonia in 100,000 parts, bed 15 0.3452, bed 16 and 17, receiving the effluent from bed 15, 0.2174 and 0.1907 part, respectively. No nitrification took place on beds 14 and 15 as long as straight septic sewage was run on the beds, but on aerating the sewage from the septic tank, by allowing it to drop into a distributing well, after falling through three screens of 1/8 inch mesh, placed two feet apart, nitrification began. With bed 14 the effluent contained on the average 0.5 part of nitrogen as nitrates, while with bed 15 the amount rose to 2.41 parts per 100,000; during the winter, however, it fell to 2 parts. Beds 16 and 17, receiving the effluent which already contained nitrogen as nitrates, acted as true aerobic beds, though bed 16 was slower in reaching its maximum efficiency, and continued to do slightly inferior work. The nitrogen as nitrates, in the effluent from bed 17, rose to over three parts in 100,000, and during the winter months averaged over two parts. The shrinkage of capacity of all the beds, through silting and breaking down of material, was remarkably small; bed 14, after eleven months' use, showed only a loss of 12.4 per cent. and bed 15 only 0.7 per cent.

L. P. KINNICUTT.

Recent Sewage Work at Worcester, Massachusetts. By HARRISON P. EDDY. *Eng. Record*, 1901, 44, 394–398.—The article gives first a résumé of the progress made toward the solution of the sewage problem since the erection of the purification plant in 1890; then of the work done from December, 1899 to 1900, and the cost of treatment.

The plant consists of sixteen chemical precipitation tanks, each having a capacity of 350,000 gallons, and fourteen intermittent filtration beds, each of one acre superficial area, and underdrained at the depth of 5 feet.

The interesting feature of the Worcester plant is, that while the regular treatment is chemical precipitation, the filter beds have not only been used in the purification of the sewage, but also for experiments on the large scale.

In the regular work during the year 1900, the average amount treated chemically was 13,100,000 gallons per day, for which purpose ten of the fourteen tanks were used. The only chemical added was lime, the sewage containing a very large amount of iron salts. The amount of lime added, averaged 1,230 pounds per million gallons; the average amount of purification as shown by daily analyses of half hour samples, and judged from the albuminoid ammonia, equaled 53.18 per cent.

Digitized by Google

The experimental work done during the year can be classed under three heads:

(1) Purification of sewage by subsidence and intermittent filtration.

(2) Purification by chemical treatment and intermittent filtration.

(3) Purification by open septic tank treatment and intermittent filtration.

For purification by subsidence and intermittent filtration, 3,000,000 gallons of crude sewage, per day, were run through three of the chemical precipitation tanks, and then on to eleven of the beds, at the rate of about 270,000 gallons per day. The amount of purification equaled 71.24 per cent.

For purification by chemical treatment and intermittent filtration, 600,000 gallons of the effluent from the chemically treated sewage was run every twenty-four hours on two of the beds. The amount of purification calculated from the albuminoid ammonia equaled about 90 per cent.

The experiments with septic tank treatment and intermittent filtration, were not begun until June, 1900, and no results are given. The odor given off from the tank and the odor from the tank effluent, were very offensive. L. P. KINNICUTT.

The Management of Septic Tanks and Bacterial Contact Beds. BY GILBERT J. FOWLER, Superintendent and Chemist, Manchester Corporation Sewage Works, England. *Municipal Eng.*, 1901. **21**, 242–246. — Mineral matter, coming from street washings, is prevented, as far as possible, from entering the septic tank by use of sufficiently large grit chambers. The finely divided suspended matter in the effluent, such as humus, finely divided clay or sulphide of iron which is always present if the sewage contains iron salts, is partially removed by mechanical arrangements at the lower end of the tank, and carried by special pipes back to the grit chamber. The time of flow through the tank is so regulated that the substances in solution in the effluent are in a state to be easily decomposed or nitrified on the contact beds; a too rapid flow brings full strength fresh sewage on to a bed and will not be purified; a too slow flow may produce a putrid effluent, which is actually poisonous to the nitrifying organisms.

For the Successful Working of Contact Beds.—The bed is to be worked very slowly at first to allow it to settle down and the bacterial growths to form. The amount is not to be increased until analysis shows the presence of superfluous oxygen, either dissolved or in the form of nitrates in the effluent. Variations of capacity of the bed are to be carefully recorded, and if the capacity is found to be rapidly decreasing, a period of rest is to be given. Long periods of rest are to be avoided during winter.

Digitized by Google

If necessary, the work of the bed is to be decreased by reducing the number of fillings per day, rather than by giving a long rest at one time. The suspended matter in the liquid that comes to the bed is to be partially retained on the surface of the bed by a layer of material, not more than 3 inches deep, finer than the rest of the material used in the bed. When the amount of suspended matter in this layer becomes excessive, the layer is to be raked off.

By careful management, founded on chemical and bacterial knowledge, a thoroughly well purified effluent can be obtained day after day for years, without exception, by purely bacterial methods. L. P. KINNICUTT.

Septic Tank System at Glencoe, Ill. *Eng. Record*, 1901, **44**, 368–369.—A description is given, with drawings of a septic tank system constructed by the Cameron Septic Tank Co., on lines similar to the plant at Exeter, England. The plant consists of a closed septic tank 56 feet long, 10 feet wide, 6 feet 9 inches high, and four high level and four low level contact beds; the upper beds being 17 feet $10^1/_2$ inches long, and 14 feet wide, the lower beds slightly larger. All the beds are filled to the depth of 4 feet with furnace clinker, broken to pass through a half inch screen. The high level beds are filled one after the other, each in turn being kept full while the next is filling. The effluent discharged from each upper bed goes on the lower bed immediately adjoining it, and the low level discharge-valves are connected to the shaft of the upper gear, so that all parts work together. The filling and emptying of the beds is effected automatically by means of the alternating gear, the same as that used at Exeter, England.

The works are designed to serve a population of 600, the natural flow of sewage and storm water provided for being 25,000 gallons. L. P. KINNICUTT.

The New Sewage Disposal Plant at Madison, Wis. A paper presented to the American Society of Municipal Improvements, by PROF. F. E. TURNEAURE. *Eng. Record*, 1901, **44**, 372–374.—Madison has a population of about 20,000, half of which is tributary to the sewers. The consumption of water is about 45 gallons per capita, and the ordinary dry weather flow of sewage is about 450,000 gallons per day; in wet weather 600,000–800,000. The sewage is fairly strong, the albuminoid ammonia ranging from 0.8–2 parts per 100,000.

In 1889 a plant was constructed, under a guarantee by the American Sanitary Engineering Co., of Detroit, consisting of four chemical precipitation tanks, total capacity 200,000 gallons, and three polarite filters, total area about one-eighth of an acre. The plant proved a failure, for though the chemical tanks did quite satisfactory work, the filters accomplished comparatively

Digitized by Google

little, clogged up rapidly and though cleaned about once in three days their capacity was not more than 300,000–400,000 gallons per day. The plant was not accepted by the city, and crude sewage continued to be discharged into the lake.

Prof. J. B. Johnson, dean of the Engineering College of the University, then proposed, as the best solution of the problem, the construction of a plant involving the use of septic tanks and intermittent filters.

The tanks, two in number, are simple rectangular reservoirs each 30x130 feet, inside measurements, built of Portland cement concrete, founded in a layer of sand about three feet below the surface, and reach to a height of about 9 feet above the original surface; they are banked by earth embankments and covered with an ordinary tar-gravel roof placed close to the surface of the sewage; numerous openings covered by simple board covers, permit access to the tanks. The depth of sewage varies from 8 feet at the inlet to 6 feet at the outlet.

The filter bed is arranged in two stories, one 12 inches above the other, each 140 x 300 feet; the upper bed is composed of 2 feet of cinders 3/8–1 inch in diameter, resting on hemlock boards, laid with 1/4 inch space between.

The lower bed also 2 feet in thickness, is made of cinders 3/16–3/8 inches in diameter, placed on a floor of inch boards, laid on the ground, and having wooden drains constructed therein 16 feet apart.

The distributing system is divided into seven sections, each section has a main distributing pipe from which branch 3 inch pipes 20 feet long; these are perforated at the top with 5/16 inch holes, placed 1 foot apart. These 3 inch pipes are laid on 3 x 6 inch planks on top of the bed and are covered with boards placed an inch or so above the pipe. The whole is then covered with cinders or other cheap covering to a sufficient depth to prevent freezing.

The sewage is pumped into the septic tanks through a cast-iron force main which is divided into eight branches where it enters the tank at an elevation of 4 feet below the level of the sewage. The effluent passes out at the opposite end over weirs extending the entire width of the tanks. To prevent the scum from passing off, a number of baffle boards are used. The effluent flows into a chamber having a capacity of about 500 gallons or about five minutes flow from the tanks. When the chamber is full it is discharged automatically into one of the seven main distributing pipes that carry it to the upper filter bed, so that different sections of the bed can be used at will.

The cost of the two tanks was $7,020, of the two beds, without the filling material, $7,500.

The plant has only been in operation about six weeks, but from experiments that have been made, during the past year, by the

Digitized by Google

Senior Class of Madison University, with experimental septic tanks and various forms of bacterial filters, it is thought that the above plant is capable of treating 1,000,000 gallons of sewage per day. L. P. KINNICUTT.

Second Report of Progress of the Committee on Standard Methods of Water Analysis, of the American Public Health Association. *Eng. Record*, 1901, **44**, 296–299.—The committee consisting of George W. Fuller, George C. Whipple, Harry W. Clark, Dr. Adolph Gehrmann, Dr. Wyatt Johnson, Dr. E. O. Jordan and Dr. H. L. Russell, after obtaining the opinions of the leading water analysts, and from experiments undertaken by various workers, make definite recommendations as to the determination of temperature, turbidity, color, odor, microscopical examination and quantitative bacteriological examination, leaving the recommendations, regarding the best methods for species determinations until further work can be done on the methods now in use, especially those recommended by the Biological Committee of 1897.

As to the determination of temperature, turbidity, color, odor and microscopical examination, the following points can be noted, while for the quantitative bacteriological determination, on account of the minute details gone into by the committee, the reader must be referred to the original report.

Temperature.—Temperature to be taken at time of collection, and expressed preferably in centigrade degrees to the nearest 0.5°. For obtaining the temperature at various depths, the thermophone gives the most accurate results.

Turbidity.—In field work the turbidity is best taken by the wire method. For turbid waters in connection with purification works the diaphanometer method; for waters with low turbidity the silica standards of comparison method. The standard unit of turbidity to be that produced by 1 part per 1,000,000 of finely divided silica, specially prepared from diatomaceous earth, in distilled water; the results obtained by the wire method and the diaphanometer method to be reduced to their equivalent in parts per 1,000,000 of silica.

Color.—The platinum cobalt method of color as devised by Allen Hazen (*Am. Chem. J.*, **14**, 300) to be considered as the standard, except that the unit of color shall be equal to the amount of platinum in parts per 1,000,000 rather than in parts per 10,000, as originally proposed.

Odor.—To be observed both cold and hot, and to be recorded as: *v*, vegetable, *m*, moldy, *a*, aromatic, *m*, musty, *g*, greasy, *d*, disagreeable, *f*, fishy, *p*, peaty, *e*, earthy, *s*, sweetish, etc. The intensity to be expressed by a numeral prefixed to the term expressing quality: 0, none, 1, very faint, 2, faint, 3, distinct, 4, decided, 5, very strong.

Digitized by Google

Microscopical Examination.—The modified Sedgwick-Rafter method, as discribed in Whipple's "Microscopy of Drinking Water," the results to be expressed in number of standard units per cubic centimeter. L. P. KINNICUTT.

Interim Report of the Royal Commission on Sewage Disposal. *Eng. Record*, 1901, **44**, 200–203.—The commission, which was appointed by Royal Warrant in 1898, has already examined a number of witnesses, visited many sewage works of various kinds, and has instituted through its own officers a large number of experiments. These investigations are still in progress. The commission has, however, arrived at conclusions on three questions, and has considered it advisable to make a preliminary report. The three questions are:

(1) Are some sorts of land unsuitable for the purification of sewage?

(2) Is it practicable uniformly to produce by artificial processes alone an effluent which will not putrefy, and so create a nuisance in the stream into which it was discharged?

(3) What means should be adopted for securing the better protection of our rivers?

In answer to the first, the report states that it is doubtful if any kind of land is entirely unsuitable, but that in case of stiff clay and peat lands, the power to purify sewage seems to depend on the depth of the top soil, and when the depth of the top soil is less than six inches, the area required would be so great as to render land treatment impracticable.

The present artificial processes are classified as follows:

(1) Closed septic tank and contact bed. (2) Open septic tank and contact beds. (3) Chemical treatment, subsidence tanks and contact beds. (4) Subsidence tanks and contact beds. (5) Contact beds alone. (6) Closed septic tank, followed by continuous filtration. (7) Open septic tank followed by continuous filtration. (8) Chemical treatment, subsidence tanks and continuous filtration. (9) Subsidence tanks and continuous filtration. (10) Continuous filtration alone.

The commissioners state, that while not in a position to express, as yet, the relative merits of these artificial processes, they are satisfied that it is practicable to produce by artificial processes alone, either from sewage alone or from certain mixtures of sewage and trade refuse, effluents which will not putrefy, and which might be discharged into a stream without fear of committing a nuisance.

In answer to the third question, the commission advocate the appointment of a separate commission, or a new department of the local government board, which shall be a supreme rivers authority, dealing with matters relating to rivers and their purification. L. P. KINNICUTT.

Digitized by Google

Septic Tanks, Vancouver, B. C. *Eng. Record*, 1901, **44**, 339.—Three septic tanks, designed to treat the sewage of three different districts having populations of 5,000, 3,000, and 2,000 respectively, and constructed from plans furnished by the Septic Tank Syndicate, were put in operation about the beginning of the present year. In one of the tanks, five or six cart loads of night soil are added each night. No analyses of the effluent have as yet been made, but their action is satisfactory. Only one complaint has been made as to odor, and this was due to the backing up of the tide. The effluent is discharged into salt-water, without further purification. L. P. KINNICUTT.

Sewer Ventilation, Leicester, England. *Eng. Record*, 1901, **44**, 339.—An interesting series of experiments, made by E. G. Mawbey, city engineer, on sewer ventilation, in which was determined, not only the velocity of the air in the shafts, but also temperature and humidity of the air outside and inside the shafts, temperature of the sewage and air in the sewers, the barometrical pressure, the velocity of the wind and rainfall, all of which are factors more or less affecting the ventilation of sewers.

L. P. KINNICUTT.

International Eng. Congress at Glasgow. *Eng. News.*, 1901, **46**, 273.—Three interesting papers on sewage precipitation were read before the International Engineering Congress at Glasgow, September, 1901, the first of which, by Lieut. Col. A. S. Jones, was a decided expression of approval of what is generally known as sewage farming, while the third, by Mr. McDonald, of Glasgow, was a very outspoken statement in favor of chemical precipitation, as illustrated by the work done at Glasgow. The second was a very carefully prepared paper by Mr. K. F. Campbell, borough engineer at Huddesfield. The conclusions that he arrived at, from the experiments as stated in his paper, were as follows: (1) That by no process can the formation of sludge be obviated; (2) when the crude sewage is treated in contact beds the rapid accumulation of matter in the beds renders the process impracticable; (3) that by the use of a small quantity of lime and copperas, followed by contact bed treatment, a satisfactory effluent can be produced; (4) that the contact beds used for the purification of the effluent after chemical precipitation will not retain their capacity indefinitely, and that in the course of a number of years it will be reduced to such an extent as to render necessary the washing or riddling of the material; (5) that by the open septic process about 40 per cent. of the sludge is destroyed; (6) the septic effluent is not as amenable to subsequent contact bed treatment as the effluent from chemical precipitation; (7) the capacity of the beds treating the septic effluent decreases more rapidly than that of the beds treating the effluent after chemical precipitation, owing to the excessive amount of sus-

Digitized by Google

pended matter in the septic effluent; (8) the septic effluent after double contact is frequently unsatisfactory.

L. P. KINNICUTT.

INDUSTRIAL CHEMISTRY.

The New Plant of the Alpha Portland Cement Co., at Alpha, N. J. *Eng. Record*, 44, 313–316.—This article begins with the history of the plant. The mode of occurrence of the cement rocks, and something as to the quantity owned by the company are stated. Analyses of both raw material and the finished product are given. The new mill, known as No. 2 and which adjoins No. 1 or the old one, is described in detail. Each mill uses 500 to 600 tons of rock per day. The drilling is done by means of compressed air. Two No. 6 Gates crushers are used to crush the stone. Both the raw material and the clinker are ground in the main building by means of 10 ball mills and 10 tube mills. There are ten rotary kilns, which are fired with powdered bituminous coal. The coal is ground in the mills of a separate house, and they are capable of supplying 150 tons per day. In the kiln house are five coolers, each cooler serving two kilns. This house adjoins the main building. Special attention is called to the fact that wherever it is possible, belt conveyors are used. It is believed that less power is required than with the screw conveyor and bucket elevator, and it is less subject to breakdowns. The power for mill No. 2 is furnished mainly by two cross compound engines of 800 horse-power each. In plant No. 1 the engines have been replaced by alternating current motors. The current is generated by the Lehigh Power Company and transmitted 2½ miles. This substitution was made on account of the scarcity of water. A chemical analysis is made of the average of the drillings of each blast, and five analyses are made per day of the ground stone as it passes to the kilns. Once in twenty-four hours an average sample of the finished product is subjected to chemical and physical tests.

C. J. MOORE.

The Development of the By-Product Coking Industry. BY WM. GILBERT IRWIN. *Eng. Mag.*, October, 1901.—The development of manufacturing industries is due mainly to the advance made in fuel supplies. To-day the principal fuel used in the United States for furnace and foundry purposes is coke. The methods for producing coke are undergoing a decided revolution, and the author predicts that the probable result will be the eradication of the bee-hive oven and the substitution of the various types of the new by-product system. The plans of the new system originated in France, Germany, and Belgium, where they are now used almost exclusively. The introduction into the United States has been slow on account of the immense expenditure of capital that

Digitized by Google

would be necessary, if the old ovens were to be replaced before they are unfit for use. The advantages of the new by-product system are not only to be found in the fact that valuable gas, ammonia, and tar are saved, but also in that the per cent. of coke yielded is higher, and the quality is better, for it is hard, tough, and uniform. The ovens of the new system appear to be more durable than bee-hive ovens. The principal types of the new system are the Otto-Hoffman, the Semet-Solvay, and the Simon-Carvé. In the Semet-Solvay type horizontal flues with thin or hollow walls are used, and there is employed a continuous recuperative system of firing. The ovens are built in batteries of thirty or some multiple of this number. Each oven is 30 feet long, 7½ feet high, and 16 to 20 inches wide. The tiles composing the flues are independent of the main structure of the oven, and this allows expansion and contraction without affecting the main brickwork of the oven construction. The charge is about 12,000 pounds per oven, and the time of coking varies with the per cent. of volatile matter in the coal and also with its composition. The flues may be inspected at any time. The heat is very uniformly applied by admitting the combustible gas at the ends of all except the lowest flues. Vertical flues are used in the Otto-Hoffman type, and the system of firing is regenerative. The standard oven of this type is 33 feet long, 6 feet high, and 16 to 22 inches wide. The charge per oven is 6 to 7 tons. The average analysis of coke made by this type is as follows: Fixed carbon, 86.47 per cent.; volatile matter, 1 per cent.; ash, 11.57 per cent.; moisture, 0.317 per cent.; sulphur, 0.96 per cent.; phosphorus, 0.0107 per cent. Any type of the by-product system is capable of coking any kind of coal. The Solvay Process Co. was the first to introduce this system in the United States. They use the coke for their works and the ammonia in the manufacture of soda. In Ensley, Ala., 120 ovens of this system supply the iron furnaces with coke, and the gas recovered is being successfully used by the Alabama Steel and Shipbuilding Co. in metallurgical work. The cost of Semet-Solvay or Otto-Hoffman ovens, equipped with by-product recovery apparatus, can be placed at from $2,500 to $3,000.

C. J. MOORE.

Wooden Pavements at Home and Abroad. BY F. A. KUMMER. *Eng. Record*, **44**, 404–406.—The author divides wooden pavements in this country into three phases. First, the corduroy road; secondly, the pavement made of square blocks which have been dipped into tar, a form which proved to be very unsatisfactory; thirdly, creosoted blocks laid on a concrete foundation. The opinion of the author is that a fourth stage has made its appearance in Boston, and he predicts for it a promising future. Wooden pavements abroad are then described. The types selected are those of Paris and London. In the former the mate-

Digitized by Google

rial is manufactured and the pavement laid under the management of the city authorities. Blocks of soft wood, treated with about ten pounds of creosote per cubic foot, are laid on a concrete foundation. The surface is covered with a thin layer of sand to prevent slipping. The cost is about $3.10 per square yard and the average life is ten years. In London there are now about 4,000,000 square yards of wooden pavement. Here the work is done by contract, and the cost for paving the district of Kensington in 1900 was $2.25 per square yard. An extract from the specifications of the city of Boston for laying pavement on several of its streets is given. The article is concluded with a description of what the author considers an ideal wooden pavement. Undoubtedly, the best wood used for this purpose is the heart of the long-leaf Georgia pine, and it is recommended that into each cubic foot of this there be forced from 20 to 22 pounds of a mixture formed by incorporating creosote oil with 50 per cent. of rosin. C. J. MOORE.

Gas versus Electricity. BY ALTON D. ADAMS. *Electrical World and Eng.*, **38**, 676–678.—In this article the author compares the incomes of the gas and of the electric systems of Massachusetts along two distinct lines: First, he determines the changes in the amount of income in each system during the same period; and, secondly he shows the relative incomes of each for the period above referred to. The earnings of each system are divided into two classes, the income derived from public service and that from individual service. A table is given showing the yearly income of each class of the gas system from 1886 to 1900, and of the electric system from 1890 to 1900. A second table shows the ratio of the income of each year to the income of the year ending June, 1890; and from these figures curves are drawn, which illustrate the rapid advance made by electricity in the past ten years. During this period the average yearly increase in the income for electric energy was nearly 20 per cent. while the income for gas has increased only 3.7 per cent. each year. The income from electric energy used for street lighting has increased 11.5 per cent. each year, while for gas there has been an annual decline of 4.6 per cent. A third table shows the relative amounts of incomes from gas and electric service. The income derived from the sale of gas was 2.5 times that derived from electric energy in 1890, but in 1900 these figures had decreased to 1.16. A curve is constructed, illustrating the changes as they took place between these two dates. The author concludes that electricity is forcing gas out of the field of illumination, and relegating it to heating purposes. C. J. MOORE.

A New Type of Storage Battery. *Electrical Rev.*, 39, 521.—This article refers to the Reuterdahl battery, which it claims possesses several advantages over other forms. The electrode

Digitized by Google

serves only to conduct the current, and is, therefore, light in weight. The active oxides are retained by sheets of a non-conducting material. The holding plates are flexible, and readily yield to any change of form of the active material. Local action is reduced to a minimum by the least possible contact between the electrolyte and the electrode. On account of the inability of the active material to jar out, the new plate is well suited to automobile and yacht work. The lead-zinc cell is recommended for open-circuit work where high voltage is desired. C. J. MOORE.

Oil Burning Systems for Locomotives. *Eng. News*, 46, 312–313.—Oil is now extensively used as fuel for locomotives by some railroads on the Pacific slope, and this use of it has been introduced in Texas since the development of the oil wells in that state. The fire-box, burner, and oil tank of this system are illustrated and described in the article. The burner patented by W. N. Best appears to possess several advantages over other forms. The results of several experiments performed by the International and Great Northern Railway are given, and as compared with the cost of coal required per 100 miles run, the report shows a saving of $10.75 in favor of oil. C. J. MOORE.

AGRICULTURAL CHEMISTRY.

How Ought Phosphatic Slag to be Employed in Agriculture? BY F. CONSTON. *Sci. Am. Supplement*, 52, 21,593–21,594.—The author discusses the composition and value of slags formed from the process of dephosphorization of iron, and compares them with the superphosphates as a source of phosphoric acid in agriculture. From the results cited from Grandeau with oats, the slag proved superior to superphosphate and Ardennes phosphate. The slag seems especially adapted to soils deficient in lime. The work of Wagner on the influence of the fineness of the slag, and of Petermann on the depth of applying in the soil are quoted. The results of Tetard show that the highest results were obtained by mixing slag with superphosphate in the proportion of three to one. Slag should be mixed with other fertilizers but not with ammonium sulphate, as in this case the ammonia would be immediately disengaged. D. W. MAY.

Convention of Association of Official Agricultural Chemists, 1901.

The eighteenth annual convention of the Association of Official Agricultural Chemists met in Washington, D. C., November 14, 15 and 16, 1901. The meeting was presided over by the president, L. L. Van Slyke.

The president reviewed the history of the association and the lines along which it had advanced. The growth of its work has

Digitized by Google

been great in amount, as well as in its varied character. From the consideration of methods of analysis, the work has extended further into lines of original research. Individual compounds must be discovered before methods can be provided for their estimation. The association should encourage more research with the study of methods as a secondary object. Chemists with a much broader preparation are needed, analysts simply not being fitted for research work.

The attendance was the largest in the history of the Association, being well on toward a hundred. The meeting was exceptional in that comparatively small time was taken up for discussion. This was due mainly to the nature of the work, which was in a large degree of a pioneer character.

The following were elected as officers for the coming year: President, H. J. Wheeler, Kingston, R. I.; Vice-President, R. J. Davidson, Blacksburg, Va.; Secretary, H. W. Wiley, Washington, D. C.; Additional Members of Executive Committee, C. G. Hopkins, Urbana, Ill., and F. D. Fuller, Geneva, N. Y.

Nitrogen, W. R. Perkins, referee.—The work during the past year has been the continuation of trials of the neutral permanganate (Street) and alkaline permanganate (Jones) methods for determining available organic nitrogen. The results by the neutral permanganate method do not agree perfectly, but the method is of value in distinguishing between the different grades of nitrogenous material as determined by vegetative tests. It is recommended that a modification of the neutral permanganate method be adopted provisionally, and that the alkaline permanganate method be further tested. Also that a caution be inserted suggesting the prolongation of the digestion in determining total nitrogen in certain high-class material, or else that this question be investigated further. These recommendations were adopted by the association.

Potash, C. R. Hare, referee.—The probable failure of the Lindo-Gladding method to obtain from mixtures of acid phosphate and potash salts the theoretical amount of potash added; the use of ammonium chloride as a possible aid in securing a solution of all the potash, and a method employing milk of lime for precipitating potash from neutral solution, was investigated. Two samples were sent out, the first determined only by the official method, the second by the official method, the official method with the addition of 5 to 10 grams of ammonium chloride to the sample before making solution, and by the milk of lime method devised by the referee. In the second sample the theoretical amount of potash was 3.35 per cent.; the average recovered by the Lindo-Gladding method 3.12 per cent.; the Lindo-Gladding method with ammonium chloride, 3.19 per cent.; and by the milk of lime method, 3.15 per cent. The addition of ammonium chloride gave higher results, but the large amount of ammonium salts left after evapora-

Digitized by Google

ting the sulphuric acid may cause loss from sputtering. Especial attention is called to the results obtained by the milk of lime method, in comparison with the Lindo-Gladding method with a large number of fertilizers containing organic materials.

From the results of his investigations the referee suggests that the cause of the low results obtained by the official method be further investigated and that the milk of lime method be submitted for trial during the coming year. These suggestions were adopted.

Phosphoric Acid, H. K. Miller, referee.—The work on phosphoric acid during the past year has been the determination of total phosphoric acid by the official gravimetric method in comparison with the volumetric, and the determination of iron and alumina by the acetate and the molybdate methods. Three samples were sent out made up of, first, basic slag; second, ground phosphate; and third, a mixture of salts containing phosphoric acid, iron, and alumina. From the results and from the referee's experience he considers the modified volumetric method as being both rapid and capable of giving highly satisfactory results. Results reported on iron and alumina were quite variable, with basic slag especially they were not concordant, the manganese present interfering with the determination. With the other two samples the acetate method modified by Carpenter gave very satisfactory results. No conclusions from the results on iron and alumina are drawn nor recommendations made, but the referee thinks that the association should take some action on a method applicable to Thomas slag. Some form of the citric acid method is advisible, probably the Wagner method.

Soils, M. E. Jaffa, referee.—The work of the past year has dealt largely with methods of determining available plant food. The citric acid method and that of $\frac{N}{5}$ hydrochloric acid have been followed in estimating available potash and phosphoric acid. With potash, the results are meager, but the tentative conclusion is reached that any soil showing 0.02 per cent. of K_2O by either of the above methods is not in pressing need of potash. Work along this line is urgently desired and the citric acid method should be further investigated. No definite conclusions are reached with phosphoric acid.

The work on humus and humus nitrogen was for the purpose of showing the relation existing between the nitrogen extracted by ammonia and that contained in the NaOH and KOH leachings. The comparison of humus nitrogen extracted by NH_3 and NaOH solutions is not very satisfactory. There is agreement between some of the results for the nitrogen by NaOH, but those extracted by the NH_3 solution are not concordant. The amounts of nitrogen dissolved by KOH and NaOH are identical, and while the percentages of humus in three samples are high, those of the humus nitrogen are correspondingly low.

Digitized by Google

The Rothamsted method of sampling soils is not so applicable to the larger part of the arable lands of California as the method employing a post-hole auger, adopted by Hilgard. The latter method requires less work and less time for taking the sample, the exact point of change from surface to subsoil can be ascertained, and much less bulk has to be handled.

Ash, G. S. Fraps, referee.—The work during the year has been continued on methods of preparing the ash. The point specially noted was whether sulphur or potash is driven off when the substance is incinerated with calcium acetate in an open dish. Two methods were tested for sulphur, one using calcium acetate, and the other a modified nitric acid method. From the results the calcium acetate method does not give correct values for sulphur, although they agree to a certain extent. It appears that the loss of sulphur is not due to volatilization of sulphates, but to the escape of organic sulphur compounds. The nitric acid method, with certain modifications, gave fairly satisfactory results. With potash the calcium acetate method does not give correct results using an open dish and probably not with a closed dish. The following recommendations were adopted: That the modified nitric acid method for determining sulphur in plants be used as a provisional one; that the determination of chlorine be omitted until a method can be devised which will give more accurate results; that the determination of potash by ignition of the substances with sulphuric acid, as in the determination of potash in fertilizers, be adopted as an alternative method.

Foods and Feeding-Stuffs, W. H. Krug, referee.—The results reported relate to the determination of moisture, starch, pentosan, and galactan. The recent work of Kröber on the phloroglucinol method is reviewed; the chief difference between his results and those of the chemists of the association lies in the statement of the former that the presence of diresorcinol in the phloroglucinol does not affect the final result. This point is not of importance, however, as the official method contains a convenient way of purifying the phloroglucinol. It is suggested that a uniform time of drying of four hours at 98.5° to 100° and the weighing of the Gooch crucible in a weighing-bottle, as proposed by Kröber, be incorporated in the official method of the association. The recommendations of the referee deal mainly with minor changes, leading to more exact methods. It is recommended that the method used for drying sugars be adopted as optional for the drying of feeding-stuffs. With the phloroglucinol method it is recommended that instead of using 3 grams of material, a quantity of the material be chosen so that the weight of the phloroglucide obtained shall not exceed 0.3 gram. These and a number of other minor modifications of this method were adopted.

A paper on "The Determination of Pentosan-Free Crude Fiber" was presented by G. S. Fraps. The result of a test of

Digitized by Google

König's method, with modifications for determining pentosan-free crude fiber, was reported. The method is found to be much shorter than the official one, the substances being digested, filtered and washed in three hours. It has the following advantages: It yields a fiber practically free from pentosans, the manipulations are less complicated, and the time is shortened. It requires further study, however, in its application to cottonseed meal. The association recommended the further study of this method by the referee.

Liquor and Food Adulteration, W. D. Bigelow, referee.—At the last meeting of the association this subject was divided under fifteen heads, with the appointment of an associate referee for each subject. Thirteen reports have been embodied in a report which has been submitted to 106 chemists. With some minor changes, these reports were ordered printed as a separate bulletin and were made provisional for the present.

Dairy Products, J. A. LeClerc, referee.—The work during the past year has been divided into the determination of albumen in milk, and the detection of renovated butter. The estimation of albumen by different chemists has never given concordant results. Various substances have been used for precipitating the albumen, but this year it was obtained solely by means of heat, it being believed that there is no specific albumen precipitant. Attention is called to the importance of a more systematic study of the nitrogen compounds in milk. No definite conclusions are drawn but it is recommended that the work on the albumen of milk be continued.

In the detection of renovated butter, six methods were followed. From the work reported it has been found possible to determine if the sample is genuine butter. If it is not, the ordinary chemical methods for the examination of the fat will show whether the sample is oleomargarine or renovated butter. No recommendations were made and it was suggested that the work along this line be continued.

Sugar, E. E. Ewell, referee.—The referee deems it more important to devise new methods for sugars than to try to improve the deficiencies of old ones. He stated that there were several important lines of work which ought to be taken up, and called attention to the great need of an official method in regard to sugar-beets. It was recommended that the work be divided and that there be appointed a referee for optical methods, a referee for the determination of reducing sugars, and a referee for the study of the analytical methods of the sugar industry. These recommendations were adopted.

Tannin, W. K. Alsop, referee.—Four samples of tanning materials were sent out for testing the official method and the chromed hide powder method. The reports indicate (1) that the results obtained by the use of wet chrome hide powder are more

Digitized by Google

accurate than those with unchromed hide, (2) that more concordant results can be obtained in the use of the weaker solution, (3) that the method of drying has not much influence on the tannin result when the determinations are made in the same manner, (4) that the determination of soluble salts is a weak point and that some method must be adopted that chemists will follow. The referee urges, therefore, that the chroming of hide powder twenty-four hours with 3 grams of chrome alum per 100 grams of hide be made the official method. He also advocates a provisional method for dry chromed hide and recommends that it be carefully experimented with during the coming year. The adoption of 0.35 to 0.45 gram of tannin per 100 cc. as the official method for solution of tanning materials is advocated. It is the method adopted by the European association and would bring methods more in accord. In evaporations, 50 cc. is considered too small and 100 cc. is therefore advocated for obtaining all residues. A number of modifications are recommended in the official method.

A report of the meeting of the International Association of Leather Trades Chemists which met at Liege, Belgium, on August 28th, was made by Mr. W. H. Krug. The changes made in the methods used by this association were: (1) the adoption of Freiberg hide powder, the maximum cellulose content to be 20 per cent. and the manufacturer to mark each delivery with the percentage it contains; (2) the adoption of the Association of Official Agricultural Chemists' method for used tanyard liquors. The chrome hide powder method was not very favorably considered by this association. It was suggested that the correction for the absorption of the filter-paper in the determination of the soluble solids be investigated by the referee.

Insecticides and Fungicides, L. A. Voorhees, referee.—This is the first year in which any analytical work of a cooperative nature has been undertaken. The results are somewhat meager, and the referee does not make any specific recommendations. The attention of the association is called to the following considerations: That the content of cyanogen in potassium cyanide is of interest, but for fumigating, the determination of impurities and the character of the gases which they supply will be of more value; that the purity of the lyes for the home-making of insecticide soap is of importance, but there is much in the analysis of the soaps that is of no importance to the entomologist. It is recommended that the methods reported be continued.

The report on arsenical insecticides was made by the associate referee, J. K. Haywood. The methods tested were the sodium acetate method for the determination of the arsenic content of Paris green and the water extraction method for showing the stability of the Paris green and giving an idea of its action in orchard practice. These methods were adopted provisionally and their further study ordered. D. W. MAY.

Digitized by Google

The Relation of Lime and Magnesia to Plant Growth. By Oscar Loew and D. W. May. *U. S. Dept. Agr., Bureau of Plant Industry Bull.*, No. 1, 1–53.—The liming of soils from a physiological standpoint is discussed by Dr. Loew, references to considerable literature relating to this subject being given. According to the author, lime is necessary for the formation of certain calcium compounds of nucleo-proteids required in the organized structures of nuclei and chlorophyll bodies, and magnesia serves for the assimilation of phosphoric acid. Data are compiled on the lime and magnesia content of the soils of different countries, the results showing a wide variation in the ratio of lime to magnesia, a predominance of lime over magnesia in the majority of soils, and never a marked excess of magnesia over lime in soils of great fertility, but generally an excess of lime. The ratio of lime to magnesia required by different plants is considered, the conclusion being drawn that for the best culture of the sugar-beet the available magnesia content of the soil should nearly equal the available lime content. The article concludes with a brief discussion of the determination of the lime and magnesia content of soils and the correction of an excess of magnesia by liming.

An experimental study of the relation of lime and magnesia to plant growth is reported by Mr. May. A large number of experiments were conducted with different economic plants, including cowpeas, beans, tobacco, and cereals, in which the effect of varying amounts of calcium and magnesium carbonates, sulphates and nitrates was studied. Water, sand, and soil cultures were employed. The results of the work as summarized show that a great excess of magnesia over lime is noxious to plant growth, and that a great excess of lime over magnesia hinders the physiological action of the plant; that the best proportion of soluble lime to soluble magnesia for the germination and growth of plants is 5:4 (molecular weight), or 7:4 (actual weight); and that magnesium nitrate and magnesium sulphate in excess of lime are more injurious than magnesium carbonate on account of the greater solubility of the former, and that calcium sulphate and calcium nitrate are more efficient in overcoming the injurious effects of magnesia than calcium carbonate for the same reason.

H. W. Lawson.

A Study of the Lupine Plant. By A. L. Knisely. *Oreg. Agr. Expt. Sta. Rep.*, 1901, pp. 30, 31.—Determinations of the nitrogen content of the leaves, pods, stems, roots, and nodules of the lupine plant at different stages of growth. H. W. Lawson.

Analyses of Fertilizers.—*Ala. Agr. Expt. Sta. Bull.*, No. 115; *Me. Agr. Expt. Sta. Bull.*, No. 77; *N. H. Agr. Expt. Sta. Bull.*, No. 80; *R. I. Agr. Expt. Sta. Bull.*, No. 81.

H. W. Lawson.

Digitized by Google

Agriculture in China. By CHARLES DENBY. *Forum*, 32, 328–340.—Like all questions pertaining to China, the history of agriculture shows great antiquity. The system practiced at the present time gives great attention to details but exhibits no application of science in either methods of culture or improved implements. The most potent element is in the untiring industry of the people. The fields are treated like gardens, fertilizers from all sources carefully saved and irrigation practiced. While it is difficult to estimate, it is probable that yields, because of careful cultivation, are slightly higher than in this country. A large variety of crops is grown, cotton being one of the staples. Tea is exported in large quantities and while efforts have been made to improve its culture and curing, but little progress has been made. Land is mostly in small holdings and the condition of the agricultural classes while poor compares favorably with that of people in other lines of industry in that country. It is of historical interest to note that agrarian questions, such as large accumulations of land, and the loaning of state monies to farmers at a low rate of interest, have come up during the centuries of China's existence. D. W. MAY.

Sugar and the New Colonies. By CHARLES A. CRAMPTON. *Forum*, 32, 283–291.—The author, who is chief of the Internal Revenue Bureau, treats of sugar, the principal article of export of the tropics, as the essential factor in the prosperity of those sections. He devotes special consideration to the relations existing between the United States and her newly acquired colonies, and the bearing sugar has upon the prosperity of the latter and the strengthening of the ties between the two. Sugar, since the time of Napoleon, has been in politics and its treatment at the hands of Congress will be governed by political as well as economic causes.

While sugar-beet production has grown enormously in Europe its advance in this country has been slow. In the United States the increased annual consumption of sugar for several years past has been almost five times as much as the increased production in the same area. With Hawaiian and Porto Rican sugar free, we must still import large amounts of sugar, and the author advocates a differential duty in favor of Cuba. His ideas may be shown from the following sentences: "Cuba must one day be ours, an integral part of our country, sharing in all the benefits and advantages of our Republic," and again "laying aside, therefore, all thought of annexation or free trade in the immediate future, the friends of Cuba should endeavor to secure from Congress such tariff concessions as can be reasonably granted without immediate danger to domestic interests."

D. W. MAY.

Digitized by Google

PATENTS.

The United States grants monopolies to individuals of five different kinds; *viz.*, copyrights, labels, designs, trade-marks, and patents. These abstracts relate only to the last, which are contracts between the inventor or discoverer and the public, by which the former is given a monopoly of his invention for seventeen years, in consideration of fully describing it, that the public may know how to use or practice it at the end of his monopoly. The description ends with a claim, which is intended to set forth, in concise language, exactly what is new, and the claim is thus the measure of the patent. Copies of any patent will be mailed to any one who sends the number, name of patentee, and subject of invention to the Patent Office, with five cents, or less, if a subclass is ordered. The United States patents are numbered consecutively, differing from many countries in this respect. The last number, September 17, 1901, was 683,012. These abstracts begin with 1901. The subject-matter of every patent must relate to one of four statutory subjects of invention; *viz.*, an art (or process), a machine, manufacture, or composition of matter, and must be capable of some useful application.

JANUARY 1, 1901.

664,955. Friedrich Krecke, Biebrich, Germany, assignee, Kalle & Co., Dye. The new monazo dye made by combining diazo picramic acid with 1,6-dioxynaphthalene-3-sulphonic acid. Dyes wool from acid bath deep violet changed to a deep fast black by chrome salts.

665,041. George M. Tucker, Kingston, R. I. Apparatus for determining ash. A casing supported on feet, and enclosing a Bunsen burner, carrying a double walled crucible with stirrer rod and escape pipe.

665,105. John C. Kessler, Milwaukee, Wis. 3/4 assigned to Christian Wahl and Wm. Priester, same place. Process of extracting gold and silver by a mixture of water, potassium ferrocyanide, potassium cyanide, and potassium permanganate till dissolved; precipitates by soluble lead salt insoluble cyanides of lead, gold, and silver; treats the precipitate with sodium amalgam and regenerates the solution with potassium permanganate.

665,244. Paul Magnier, Billancourt, France. 2/3 assigned to Pierre Armand and Charles Tissier, Paris, France. Process of treating fats. Saponifies fluid fats by sulphuric acid, mixes the product with water and subjects to simultaneous action of pressure, heat and electric current.

665,254. Wm. A. McAdams, New York City. Crucible lining of fused oxides of manganese and copper.

665,266. Frederick Purdy, Chicago, Ill. Process of making

Digitized by Google

illuminating gas by passing a mixture of coal gas, oil, and water gas through an electric field.

JANUARY 8, 1901.

665,426. Wm. T. Gibbs, Buckingham, Canada. Assigned to National Electrolytic Co., New York. Process of obtaining chlorates by the continuous flow of chlorides in solution between insulated electrodes at a temperature below 200° F., the cell capacity being 2–4 cu. in. per sq. in. of electrode and the current 2–4 amperes. The temperature is suitable for the decomposition of hypochlorites.

665,468. Ralph C. Robinson, Boston, Mass. Chemical Apparatus. A test glass consisting of a large tube on foot, and a capillary side tube with thistle top, the lower end united to large tube.

665,547. A. F. Poirrier, Paris, France. Black substantive sulphur dye and process of making by heating described colors of the indophenolic group with sulphur. They are water-soluble, precipitated by acids, and dye at boil.

665,617. Heinrich Precht, Neu Stassfurt, Germany. Method of making potassium hydroxide. Evaporates a solution of 50 per cent. potassium hydroxide and 0.5 per cent. potassium chloride, crystallizes at 60° C., and removes crystals of potassium hydroxide at 35° C. May first remove potassium chloride at 15° to 20° C.

665,696. Karl Schirmacher, Soden, Germany. Assigned to Farbwerke, vor. Meister, Lucius, and Bruning. Wool dye and process of making which consists in diazotizing *o-o*-diamino-*p*-phenol sulphonic acid, and combining it with *β*-naphthol. Aqueous solution violet, dyeing wool red-brown, that turns blue-black with chrome.

665,726. Albert Bertschmann, Basle, Switzerland. Sulphurized indophenol dye, and the process of reacting with polysulphides of alkalies in presence of organic solvents as alcohol, on *p*-oxydialphylamine derivatives such as 2,4-dinitro-4-oxydiphenylamine and oxidizing the product. Dyes unmordanted cotton violet to black-blue.

665,737. Emil Haussmann, Berlin, Germany. Assigned to Actien-Gesellschaft für Anilin Fabrikation. Process of dyeing. Adds glucose to the caustic alkaline solutions of sulphur dyes used in dyeing.

665,744. Hugh F. Kirkpatrick-Pickard, London, England. The process of treating sulphide ores. Ores of silver, zinc and lead are roasted to oxides, made into briquettes with coking carbon, then distillied by first coking, then volatilizing the zinc, and retaining lead and silver reduced in the briquette.

665,792. Alfred Luck, Dartford, and Charles F. Cross, London, England. Increasing stability of nitrocellulose. Adds an

Digitized by Google

aqueous solution of a metallic salt, such as zinc chloride, digests at 80° to 100° C., and washes.

665,794. Hermann Melzer, Berlin, Germany. Assigned to Chemische Fabrika auf Actien, vor. E. Schering. Process of disinfecting. Adds burnt lime to aqueous formic acid so as to vaporize it by heat of slaking.

JANUARY 15, 1901.

665,879. Wilhelm Connstein, Charlottenburg, Germany. Assignor to Benno Jaffe, Merlinikenfelds, Germany. Piperazine quinate. Molecular proportions of piperazine and quinic acid are allowed to react on each other in a solvent, when the piperazine quinate is precipitated as a white crystalline powder having feebly acid properties, soluble in water but not in alcohol, and capable of forming alkaline salts.

665,915. Moritz Kugel, Berlin, Germany. Electrolytic production of nickel, etc. Makes a tough rollable metal by electrolysis in a bath at a temperature of 30° C., or over, adding a concentrated solution of a light metal salt and a strong mineral acid, neither of which are changeable by the current, but keep the electrolyte acid.

665,953. Antoine J. O. Chalandre, Louis J. B. A. Colas and Charles J. Gerard, Seveux, France. Electrolyzing soluble salts. The process of electrolyzing an aqueous solution of sodium chloride, combining the hydrogen from the cathode with a part of the chlorine from the anode to form hydrochloric acid, introducing this acid into the anode chamber, to decompose the chlorine-oxygen compounds therein and recuperate the chlorine.

665,975. Arthur Pettit, Paris, France. Artificial silk. Composition of dry nitrocellulose 100 parts, India rubber solution 7 parts, stannous chloride 5 parts and sufficient solvent to make the required consistency.

666,010. Heinrich Helbing and Francis W. Passmore, London, England. Solidifying mineral oils. Adds an aqueous solution of an alkaline salt of casein, then hardens by formaldehyde. Recovers the oil by distillation.

666,095. Karl Jedlicka, Basle, Switzerland. Assignor to Society Chemical Industry, same place. Orange dye. Obtained by alkylating the alkylamino acridinium dyes known as patent phosphines, which are brown-red to red powders, soluble in water, unchanged by ammonia or sodium carbonate, difficultly soluble in cold alcohol, more easily in hot, soluble in concentrated sulphuric acid, 66° Bé. with yellow color and green-yellow fluorescence, dyes tannin mordanted cotton yellow to orange-red fast to alkali.

666,096. Karl Jedlicka, Basle, Switzerland. Assignor to Society Chemical Industry, same place. Yellow acridin dye. Alkylates aminoacridin in the acridin nitrogen, in the absence of

Digitized by Google

acids, and obtains yellow dyes soluble in water with intense green fluorescence unchanged by sodium carbonate or ammonia but precipitated by caustic soda, and dyeing mordanted cotton yellow shades very fast to alkali.

666,103. Richard P. Kuhn, Alexandria, Va. Assignor to the Kuhn Formaldehyde Generating Co., of Virginia. Formaldehyde lamp. Places two or more conical perforated platinized diaphragms above a wide dish of tin for burning pan, the lower diaphragm being of lesser diameter than the upper.

666,135. Carl Goepner and William Witter, Hamburg, Germany. Making cyanogen bromides. Mixes solutions of two molecular proportions of a bromide and two of a bromate, with a solution containing three molecules of a cyanide, runs the whole into a retort containing hot sulphuric acid, and condenses the cyanogen bromide evolved.

JANUARY 22, 1901.

666,262. Caleb G. Collins, New York, N. Y. Assignor to Calvin Emory Stevens, same place. Process of making pigments. Makes a solution of barium dithionate, introduces into the same a dye salt, and passes an electric current, thereby precipitating barium sulphate with the dye.

666,300. Emil Beringer, Charlottenburg, Germany. Process of making zinc sulphide. Agitates carbon disulphide with an ammoniacal solution of zinc oxide under pressure and at a temperature not exceeding 300° F., till reaction is ended.

666,302. Caleb G. Collins, New York, N. Y. Process of making paint. Makes a solution of an alkali metal silicate, introduces a dye salt, and precipitates silicic acid with the dye by an electric current.

666,446. John W. Warren, Omaha, Nebraska. Assignor of half to I. H. Warren, Elgin, Ill. Clarifying sulphurous hydrocarbon oils. Mixes with the oils powdered Wyoming rock clay and magnesium carbonate, settles, and draws off.

666,533. Jules H. Lavollet and Gustav E. Bourgoin, Paris, France. Process of purifying water. Reduces insoluble manganates to powders, maintains the same in suspension in the liquid while an electric current is passed through it. 666,534 and 666,535 are for the same process by the same party applied to fermented liquors and to perfumes.

666,594. Oscar Bally, Mannheim, Germany. Assignor to the Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Violet anthracene dye. Obtained by heating a halogenized aminoanthraquinone sulpho acid with an aromatic amine, and which is soluble in water, blue to violet-blue, also in carbonate and caustic soda, if dilute, but insoluble in strong solutions of either reagent.

666,627. Max Neumann, Wittenberg, Germany. Assignor to

Digitized by Google

Westphalische-Anhaltische Sprengstoff Aktiengesellschaft, Berlin, Germany. The process of reacting on aniline with fuming sulphuric acid, diazotizing the sulphanilic acid thus formed by nitrous acid, and acting on the diazobenzene sulphonic acid with nitric acid.

JANUARY 29, 1901.,

666,657. Heinrich Fischer, Peçek, Austria-Hungary. Apparatus for obtaining ammonia. In combination, the retort, the screw therein, gearing connected with the screw and shaft, belt pulleys for operating the gearing in either direction, and an automatic belt shifter of specific construction.

666,702. Robert E. Schmidt and Andreas Jacobi, Elberfeld, Germany. Assignors to the Farbenfabriken, of Elberfeld Co., New York, N. Y. Anthraquinone dye. Nitrooxyanthraquinone sulphonic acid is heated with primary aromatic amines as paratoluidine, and the dye separated as a dark blue powder, difficultly soluble in water and dilute caustic soda with blue to blue-green color, but giving a green solution with concentrated sulphuric acid of 66° Bé. changing to blue on the addition of boric acid, dyeing unmordanted wool red-blue and chrome mordanted wool green-blue.

666,846. Winthrop C. Durfee, Boston, Mass. Process of dyeing. Treats fibrous materials with dibasic saccharic acid ($C_6H_{10}O_8$), or its salts in connection with the usual mordants.

666,866. Julius Herbabny, Offenbach-on-Main, Germany. Assignor to K. Oehler, Anilin und Anilin Farben Fabrik, same place. Blue cotton dye. Combines one molecule of an aminonaphtholsulphonic acid with the intermediate product of a paradiamine and a sulphonic diazonaphtholsulphonic acid. In a dry state they are gray-black powders, insoluble in alcohol, soluble in water with a pure blue color, unchanged by dilute hydrochloric acid or dilute soda, but turning red-violet on adding concentrated soda-lye, and blue-green with strong sulphuric acid that precipitates blue on the addition of water, and dyeing unmordanted cotton a pure fast blue.

666,867. Julius Herbabny, Offenbach-on-Main, Germany. Assignor to K. Oehler, Anilin und Anilin Farben Fabrik, same place. Claret-red disazo dye. Combines acetylaminonaphtholsulphonic acid with the intermediate product from paradiamines and the oxycarboxylic acids of the benzene series. When dry the dye is brownish violet powder, hardly soluble in cold, easily soluble in hot water, giving a yellowish red solution precipitated the same color by soda-lye, and brown-yellow by hydrochloric acid, giving blue-violet with strong sulphuric acid that precipitates on dilution with water.

666,980. William C. Sellar, London, England. Method of making silicofluorides. Fuses calcium fluoride with calcium

Digitized by Google

chloride, cools, powders and mixes with silicious matter, heats with strong hydrochloric acid in closed vessel, removes excess of acid for reuse, adds a suitable salt to precipitate a salt of silicofluoric acid, and separates the precipitated salt.

FEBRUARY 5, 1901.

667,191. William J. Cordner, London, England. Assignor to Louis D. Brandeis, Boston, Mass. Process of synthetic production of India-rubber. Mixes intimately clean Rhea fiber with the latex of the Tabernaemontana crassa, heats, reduces mechanically to a uniform condition, and treats the mass with a curing agent, such as sulphur, potassium permanganate, etc., during such reduction.

667,358. Johann Behrens, Bremen, Germany. Process of making acetic acid. Dissolves calcium acetate in acetic acid of not less than 60 per cent. strength, decomposes the mixture by sulphuric acid, and separates the acetic acid.

667,359. George H. Benjamin, New York, N. Y. Process of producing alcohol for use in the arts alone. Forms a mixture of hydrogen ethyl sulphate, water, and a noxious body which has a boiling-point approximating that of alcohol (bone oil), distils, and condenses the resultant vapors.

667,380. Fritz Ach, Mannheim, Germany. Assignor to C. F. Boehringer & Soehne, Waldhof, Germany. Alkoxy caffein. Reduces 3-alkoxy-8-chlorocaffeine, by heating with zinc dust and ammonia under pressure, filters, evaporates filtrate, and exhausts with chloroform, finally evaporates the chloroform, and crystallizes from benzene. The product forms shining, colorless prisms or fine needles melting at from 121° to 123° C., subliming at higher temperatures, giving the murexide reaction with chlorine water, soluble in cold water, alcohol, benzene, acetone, and chloroform.

667,381. Fritz Ach, Mannheim, Germany. Assignor to C. F. Boehringer & Soehne, Waldhof, Germany. Xanthin homologue. Heats a uric acid with an organic acid anhydride and pyridine under pressure, forming an 8-alkyl xanthin readily soluble in alkalies, ammonia, and dilute acids, scarcely soluble in boiling water, precipitated from alkaline solutions by dilute acids in the form of a granular powder, that colors on heating to a high temperature, and finally decomposes with frothing on further heating.

667,382. Lorenz Ach, Mannheim, Germany. Assignor to C. F. Boehringer & Soehne, Waldhof, Germany. Aromatic aminoaldehyde. Heats with sulphuric acid an acid derived from a product of addition of alloxan to an aromatic base, stirring, allowing to stand, pouring into water, and finally neutralizing with alkali and extracting with ether, evaporating the ether, and distilling with superheated steam. The result is paraamino toluyl aldehyde melting at from 90° to 100° C., soluble in alcohol and ether, and with difficulty in hot water.

Digitized by Google

667,388. Emil Fischer, Berlin, Germany. Assignor to C. F. Boehringer & Soehne, Waldhof, Germany. Trimethyl pseudo uric acid. Reacts on dimethyl alloxan with methylamine sulphite, producing trimethyl pseudo uric acid in colorless obliquely truncated prisms having one molecule of water of crystallization, and soluble in four parts of hot water.

667,486. Rene Bohn, Mannheim, Germany. Assignor to the Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Blue sulphur dye. Treats 1,5-dinitronaphthalene with sulphuric acid and hydrogen sulphide, the product gives a green-blue solution in water unchanged by caustic soda, a brown color with strong sulphuric acid, a blue-violet with nitrobenzene, and dyes wool blue, changing to green on chroming.

FEBRUARY 12, 1901.

667,689. Karl Elbel and Ignaz Rosenberg, Biebrich, Germany. Assignors to Kalle and Co., same place. Process of making a black substantive sulphur dye. Melts carboxylated derivatives of paraoxydinitrodiphenylamine with sodium sulphide and sulphur.

667,705. George T. Holloway and Harry W. Lake, London, England. Process of making tungstates. Adds finely divided tungsten ore to a fused bath of an alkaline silicate capable of combining freely with the iron, manganese, or calcium in the ore, whereby a pure alkaline tungstate is produced at one operation.

667,759. David Bachrach, Baltimore, Md. Nitrocellulose. A compound of nitrocellulose containing 30 per cent. of solid constituents, obtained by adding calcium carbonate and sulphuric acid.

667,861. Augustus Bischler, Basle, Switzerland. Assignor to Basle Chemical Works, same place. Process of producing chlorides of the aromatic sulphonic acids by acting with chlorine on the corresponding aromatic sulphonic acids.

667,935. Otto Ernst and Karl Schirmacher, Hochst-on-Main, Germany. Assignors to the Farbwerke, vorm. Meister, Lucius, and Bruning, same place. Violet-black azo dye. A brown powder of bronze luster, soluble in water, with a violet color little changed by ammonia, slightly soluble in alcohol, soluble in sulphuric acid blue-red, separating as a brick-red precipitate on adding water. Made by combining diazotized 6-nitro-2-aminophenol-4-sulphonic acid with β-naphthol.

668,010. Charles Green, Uxbridge, Mass. Assignor to Albert C. Warren, Newton, and George L. Stevens, Boston, Mass. A fabric having fibers and threads of wool that are enlarged, brightened, and filled with a softening and filling solution composed of mixed chlorides of magnesium, sodium, and ammonium. May add glycerol to the mixture, for which see patent 668,011.

Reissue 11,888. Charles Jacobs, East Orange, N. J. Assignor

Digitized by Google

to the Ampere Electro-Chemical Co., Ampere, N. J. The compound consisting of silicon and hydrogen in equal molecular proportions, being a yellow crystalline non-explosive compound, insoluble in water and acids, and decomposed by caustic alkali.

FEBRUARY 19, 1901.

668,164. Leon Cerf, Lyons, France. Process of making ammonia derivatives of saccharine, which consists in passing ammonia gas through a mixture of orthoanhydrosulphaminebenzoic acid with water, and concentrating the product by evaporating under 100° C.

668,197. Ernst A. LeSueur, Ottawa, Canada. Process of preparing liquid methane which consists in chilling natural gas till partial liquefaction occurs, and then subjecting the liquid rich in methane to fractional distillation, whereby the impurities are removed.

668,266. Auguste J. Rossi, New York, N. Y. Assignor of one-half to James McNaughton, Tahawus, N. Y. Process of producing concentrates containing high percentages of titanic oxide which consists in mixing with titaniferous iron ores sufficient carbon to reduce the oxides of iron and silicon, and lime enough to form a basic calcium titanate, then raising the temperature from an extraneous source to reduce the iron and silica but not the titanic acid, thus causing all impurities to go with the iron while the titanic acid combines with the lime.

668,367. Gustav A. W. Barkowski, Allegheny, Pa. Self-igniting body. Saturates meerschaum with silicic acid, then with platinum hydrogen chloride, then heats it to a high temperature, then assembles with a metal of the platinum group in contact with the body.

668,445. Arnold Hess, Hochst-on-Main, Germany. Assignor to the Farbwerke, vorm. Meister Lucius and Bruning, same place. Blue wool dye. Derived from the naphthazarin intermediate product heated with not less than three equivalents aniline and sulphonating the anilide thus formed, and which is a blue-black powder of metallic luster, soluble in water with same color, unchanged by alkali, dyeing wool blue turning a fast gray on chroming.

668,460. Emil Schmoll, Basle, Switzerland. Assignor to Basle Chemical Works, same place. Ferruginous nucleins, obtained by cultivating yeast in ferruginous nutrient material, digesting the yeast thus obtained, boiling the solid residue from the digestion with a dilute solution of sodium carbonate, and finally washing it with dilute hydrochloric acid. This ferruginous nuclein contains 1 to $1^{4}/_{10}$ per cent. of iron in stable combination, and is a yellow brown powder insoluble in water, alcohol and ether, partly soluble in soda-lye and sodium carbonate on standing, and not decomposable in the stomach.

Digitized by Google

668,580. Ivan Levinstein and Richard Herz, Manchester, England. Assignor to Levinstein, limited, same place. Bluish triphenylmethane dye, which is an alkali salt of dinitrostilbene disulphonic acid, obtained by oxidizing orthotoluene sulphonic acid with an alkaline hypochlorite in presence of caustic alkali, and neutralizing the alkaline mixture; then further oxidizing this alkaline salt of dinitrostilbene orthosulphonic acid with a permanganate solution, evaporating to dryness and dissolving out the paranitroorthosulphobenzaldehyde, condensing it with an alkylated aromatic amine, and finally oxidizing the leuco base thus produced.

FEBRUARY 26, 1901.

668,820. 669,019. Samuel W. Vaughn, Johnstown, Pa. Process of treating furnace slag, which consists in mixing slag with 5 to 25 per cent. of lime, and an equal weight of sulphuric acid, separating the soluble from the insoluble parts, concentrating the former till the magnesia lime salt crystallizes out, and separating said salt. May add a potassium salt to the residual liquor and make potash alum and alum salt. May separate the calcium and magnesium sulphates by progressive concentration.

669,030. Adam C. Girard, Paris, France. Process of making picrates; by dissolving picric acid in a fatty oil, adding a base, and then a volatile solvent to separate the oil therefrom.

MARCH 5, 1901.

669,101. Henri Reeser, Paris, France. A substance capable of causing the ignition of gas, and of serving at the same time as an incandescent mantle consisting of a metallic fabric formed of threads of a refractory alloy containing polonium, free, or in combination with tungsten, molybdenum and antimony. This mixture may also be used to saturate a body formed of asbestos, plaster and animal black saturated with collodion. This patent describes the process of separating the alleged new element polonium from the other metals of platinum ore.

669,130. Adolf Vogt, Westminster, England. Assignor to Electric Resistance and Heating Co., Limited, London, England. Process of making electrical heating appliances, which consist in heating a conductive metal as nickel and a non-conducting material as kaolin in a reducing atmosphere as hydrogen, at first to a moderate heat whereby the oxidized metallic particles are reduced, then to a welding temperature to form a refractory material by vitrification.

669,861. Georg Dycke, Constantinople, Turkey. Process of obtaining albumen from flesh, fish, etc., by mincing the same, mixing an alkaline solution therewith, filtering, removing fat from the filtrate, precipitating the albumen by dilute acid, filtering the precipitate, freeing the latter from liquid, purifying with alcohol, drying, and powdering.

Digitized by Google

669,410. Franklin Guiterman, Denver, Colo. Process of extracting zinc, from its oxidized ores by granulating them, heating from outside in a closed receptacle to a temperature just below volatilization, introducing a current of reducing gas under pressure, continuing the heat and supply of gas till all corrosive metallic oxides are reduced and removing the ore and recovering the zinc by distillation.

669,441. Hans A. Frasch, Hamilton, Canada. Producing alkali by electrolysis, also extracting ores, etc., by electrolyzing a solution of a salt of the alkali in presence of an anode consisting of disintegrated ores or mineral substances, above which a cathode is placed delivering to the upper section of the vessel the solution of alkaline salt to the cathode, withdrawing the alkali there produced above the anode, and delivering below the cathode an independent supply of the alkaline salt to the anode in the lower section of the vessel, and withdrawing therefrom the metallic solution obtained at the anode.

669,442 to Mr. Frasch relates to the same subject.

MARCH 12, 1901.

669,637. James Hargreaves, Farnworth in Widnes, England. Process of making chlorates, by hydrating crystals of sodium carbonate, forming a mass easily penetrated by chlorine, charging said mass into an absorbing tower, and passing chlorine through the mass, the soluble salt or chlorate being taken into solution and conducted away while the insoluble salt is left behind, and passing the chlorate solution through pieces of soda.

669,659. William C. Peterson, Omaha, Nebr. Making noncrystallizable beet sirup, by boiling the beets in water, skinning them, reboiling them and expressing the juice from them.

669,794. Benno Homolka, Frankfort-on-Main, Germany. Assignor to the Farbwerke, vorm. Meister, Lucius and Bruning, Hochst-on-Main, Germany. Process of making indigo, which consists in heating a mixture of orthochlorobenzoic acid and glycocoll with an excess of caustic alkalies, and in subjecting the product of reaction thus obtained to oxidation in an aqueous solution.

669,894. Rene Bohn, Mannheim, Germany. Assignor to the Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Blue dye of the naphthalene series made by heating an aqueous solution of the sulphonated leuco-compound of the naphthazarin intermediate substance with aniline hydrochloride; the dye is soluble in water with violet-blue color, changing to blue on adding caustic soda; with concentrated sulphuric acid it gives a violet solution, changing to red on heating, and giving a blue solution with aniline.

669,899. Hans A. Frasch, Hamilton, Canada. A nickel salt which is a double salt of nickel-ammonium chloride and four

Digitized by Google

equivalents of free ammonia, which may be separated from copper, cobalt, and other metals whose hydroxides are soluble in ammonia, by absorbing ammonia in a solution of salts of these metals, and adding to the mixture thus obtained sodium chloride or a similar salt capable of displacing the nickel ammonium salt.

MARCH 19, 1901.

670,021. Rudolph Heinz, .Hanover, Germany. Assignor to Gebruder Flick, Opladen, Germany. Process of making nitrites, which consists in passing sulphur dioxide free from air over a highly heated mixture of a nitrite and an alkali, as sodium nitrite and calcium oxide.

670,140. Elias Peterson, Brussels, Belgium. Assignor to the Intractable Ore Treatment Co., London, England. Process of treating sulphurous arsenic ores, consisting in pulverizing the ore and mixing it with carbon, and heating the mixture in a retort or muffle from which all air or gas is excluded, and continuing the heating till all the arsenic has been driven off as sulphide without material reduction and expelled from the retort. The residue in the retort is calcined and washed with acid to remove antimony and tellurium before further treatment.

670,198. Minnie M. Dubin, Philadelphia, Pa. Compound of lead which is a double sulphide of lead and an oxide of a metal of the alkaline group made by decomposing the sodium plumbate derived from the nitrite of soda with the sulphide of a metal of the alkaline earth group.

670,201. Edward D. Kendall, Brooklyn, N. Y. Assignor of one-half to Ferdinand F. Cimiotti, New York, N. Y. Process of producing zinc oxide and nitrites, which consists in passing an electric current between a zinc anode and a suitable cathode as carbon in an electrolyte of an aqueous solution of a nitrate or nitrates.

670,346. Alfred Luck, county of Kent, and Charles Cross, county of London, England. Process of reducing nitrocellulose to a structureless condition which consists in covering it in its original fibrous form with a diluted solvent as acetone and water adapted to render it structureless and remove the impurities, and then washing it.

670,898. Julius Herbabny, Offenbach-on-the-Main, Germany. Assignor to K. Oehler, Anilin und Anilin Farben Fabrik, same place. Blue triazol dye, a brown-black powder with a metallic luster, insoluble in alcohol but readily soluble in water, blue, turning slightly red on adding soda-lye, and giving a blue-violet precipitate with hydrochloric acid, dissolving in concentrated sulphuric acid pure blue that precipitates violet on adding water, and made by combining one molecule of dioxytriazol sulphonic acid with the intermediate product of one molecule of an aminonaphthol sulphonic acid reacting on a paradiamine.

Digitized by Google

MARCH 26, 1901.

670,450–1. John P. Ihart, New York, N. Y. Method of preparing material for purifying illuminating gas. Mixes together an iron ore, water, sulphate of iron and lime. May add dilute sulphuric acid.

670,511. William Friese-Greene, Dovercourt, and Percy E. Knell, London, England. Assignors to the Electrical Inkless Printing Syndicate, London, England. Manufacture of paper, containing an oxy-derivative of benzene which will reduce a haloid salt of silver together with a salt of cobalt or nickel. May be hydroquinone.

670,607. Olaf Borch and Lauritz P. Hviid, Copenhagen, Denmark. Process of treating calcium carbide. Grinds 10 per cent. of calcium chloride with the carbide in an air-tight mill and forms it into briquettes. Covers the briquettes with a protective coat.

670,689. Albrecht Schmidt, Berlin, Germany. Assignor to Chemische Fabrik auf Actien (vorm. E. Schering), same place. Waterproof casein. Makes an alkaline solution of casein, treats it with formaldehyde and dries it.

670,783. Millard S. Hudnall, Wichita Falls, Texas. Process of making a lubricant which consists in adding signal oil to slaked lime, until the lime emulsifies, then adding black oil and heating the mixture, and finally pouring into it a hot soap solution.

670,819. Howard Spence, Manchester, England. Assignor to himself, Francis Mudie Spence and David Dick Spence, same place. Process of making a titanium compound having the formula $TiO_2\ 2(SO_3)\ X_2O$, X being alkali and which is made by fluxing a substance containing titanic acid with a sulphate of the alkali, maintaining in the mass sufficient sulphuric acid to prevent the separation of insoluble titanic acid, cooling, adding a solvent maintaining an excess of sulphuric acid, separating the undissolved matter, concentrating the solution, and removing the crystals.

APRIL 2, 1901.

671,078. John T. David, San Francisco, Cal. Distillation of Petroleum. The process of producing a residuum suitable for use as an artificial fuel, which consists in distilling crude petroleum in the presence of potassium bichromate, at a temperature above 600° F. but below the carbonizing point of the residuum, and continuing the distillation till the residuum has reached the desired condition.

671,135. Ludwig G. Helmers, Hamburg, Germany. Assignor to the Icthyol Gesellschaft, Cordes, Hermanni and Co. Sulphonic acid salt from sulphuretted hydrocarbons. These are first treated with sulphuric acid, then neutralized with an alkaline

Digitized by Google

earth base, filtered, and the filtrate oxidized, the sulphonic acid set free by precipitating the alkaline earth with sulphuric acid, neutralizing the filtrate with a metallic base, and evaporating the liquid to dryness.

671,344. Rudolf Knietsch and Paul Seidel, Ludwigshafen-on-Rhein, Germany. Assignors to the Badische Anilin und Soda Fabrik, same place. Combines the indigo with sulphuric acid to a point below sulphonation, and then decomposes the mixture with water, obtaining a very soluble indigo which is a brown-red powder with a bronzy luster, and which, when painted on glass as a paste and dried, has a red color with a bronze-like luster.

APRIL 9, 1901.

671,479. Jacob Grossman, Manchester, England. Process of making cyanide. Ammonia gas is passed over a mixture of carbonaceous matter and a sulphide of an alkali at a temperature of from 700° to 800° C. Adds suitable iron compounds to change the cyanides first formed into ferrocyanides.

671,543. Karl Elbel and Ignaz Rosenberg, Biebrich, Germany. Assignors to Kalle and Co., same place. Black trisazo dye. Acts on 1 molecule of a paradiamine with 1 molecule of γ-aminonaphtholsulphonic acid, rediazotizes, and combines the tetrazo compound obtained with first 1 molecule of an unsulphonated diamine of the benzene series, and afterward with 1 molecule of α,β-2-naphthylenediamine-β-sulphonic acid. Is as a sodium salt, a dark-colored powder of metallic luster, easily soluble in water and concentrated sulphuric acid with blue-black color, insoluble in alcohol, and precipitated from aqueous solutions by hydrochloric acid as a black powder, and dyeing fast black.

671,560. Adolph C. Marot and Antoine Bonnet, Troyes, France. Process of mordanting cotton. Treats the cotton for aniline black with a bath composed of aniline oil and hydrochloric acid each 5 parts, sal ammoniac 1 part, potassium chlorate 2 parts, tartaric acid and copper sulphate each 0.75 part, water and alcohol each 40 parts.

671,595. James E. Hewitt, Newark, N. J. Alloy. Made of equal parts of lead and copper with a small percentage of potassium, phosphorus, tin, carbon and silicon. The metals are fused and covered with a powder containing equal parts of limestone, niter, charcoal and argol.

671,622. Arthur Eichengrun, Elberfeld, Germany. Assignor to the Farbenfabriken of Elberfeld Co., New York, N. Y. Pharmaceutical compound. The process of heating a mixture of the halogen methylic derivatives of aromatic hydroxy acids containing the group CH_2X (X meaning a halogen atom), with phenolic bodies, for example, chlormethyl salicylic acid with glacial acetic acid and β-naphthol, isolating and purifying the

Digitized by Google

products, which are crystalline substances insoluble in water, and ligroin, easily soluble in alkaline carbonates, ether, acetone and glacial acetic acid.

671,672. Louis J. E. Hubou, Le Rainey, France. Process of making carbon black which consists in exploding acetylene gas under pressure and out of contact with the air, by an electrical, chemical or calorific source of energy, and removing the deposited carbon.

671,709. Johannes Pfleger, Frankfort-on-the-Main, Germany. Assignor to the Deutsche Gold and Silber Scheide Anstalt, vorm. Roessler, same place. Process of making dialkali cyanamide. Reacts on the amide of the alkali metal with the cyanide of an alkali metal so as to form a dialkali cyanamide in accordance with the following equation :

$$Alk.NH_2 + Alk.CN = Alk_2NNC + H_2.$$

671,760. Jules A. J. Florin and Henri L. Lagache, Roubaix, France. Process of softening wool which consists in neutralizing the acid in halogenated wool, and immersing the same in an aqueous bath of a salt of a tetravalent metal in which the hydrate is feebly held, aluminum, iron, chromium, tin, and then exposing to the air.

671,769. Leonhard Ledere, Sulzbach, Germany. Process of producing acetyl salicylic acid by reacting on salicylic acid with acetic anhydride in the presence of sulphuric acid.

671,894. Victor Lendecke, Ludwigshafen, Germany. Assignor to the Badische Anilin und Soda Fabrik, same place. Process of mordanting, which consists in saturating the goods with chromium bisulphite, then passing the wet goods through an alkaline salt, as soda.

671,896. Erhardt Schleicher, Ludwigshafen, Germany. Assignor to the Badische Anilin und Soda Fabrik, same place. Violet dye ; that as a sodium salt is a dark powder soluble in water, and which on reduction yields the 1,8-amidonaphtholdisulpho acid used as initial material and 1,4-naphthylenediamine. α-Naphthylamine is used in the formation of the dye.

671,902. Akim Tkatsch, Ludwigshafen, Germany. Assignor to the Badische Anilin und Soda Fabrik, same place. Azo dye ; obtained by combining orthonitroorthoaminophenolparasulpho acid and hydroxyphenylglycocollsulpho acid IV, dyeing wool brown shades, that on chroming turn Bordeaux red, soluble in water with wine-red color turning redder on adding an excess of soda.

671,903. Akim Tkatsch, Ludwigshafen, Germany. Assignor to the Badische Anilin und Soda Fabrik, same place. Brown azo dye ; obtained by uniting diazotized orthonitroorthoaminophenolparasulpho acid and hydroxyphenylglycocollsulpho acid III, soluble blue-red in water, turning wine-red on adding excess

Digitized by Google

of sodium carbonate, and orange-yellow with concentrated sulphuric acid.

671,904. Akim Tkatsch, Ludwigshafen, Germany. Assignor to the Badische Anilin und Soda Fabrik, same place. Brown azo dye from diazotized picramic acid and hydroxyphenylglycocollsulpho acid IV, dyes wool a red-brown, shading darker on chroming, and dissolving yellow-red in water, turning yellower on adding sodium carbonate.

671,908. Hermann Gussmann, Hochst-on-Main, Germany. Assignor to the Farbwerke, vorm. Meister, Lucius and Bruning, same place. Black sulphur dye. Heats paraoxymetamethylparaamidodiphenylaminorthosulphonic acid with sulphur and alkaline sulphides at a high temperature.

APRIL 16, 1901.

671,972. Bert Millison, Brooklyn, N. Y. Ink. One part each of powdered soap and pigment, and 100 parts of glycerol.

671,988. Joachim H. Burfeind, Salt Lake City, Utah. Assignor to Winfield S. Keyes, Butte, Montana. Method of treating amalgam containing copper or precious metals. Adds sulphur to the amalgam at a temperature below 100° C., adds water, heats, and separates the cupric sulphide formed.

671,994. Emil Flick, Jr., Opladen, Germany. Process of making soluble indigo paste. Adds strong ammonia to a mixture of indigo and a finely divided metal with continued agitation, then presses.

672,059. Otto von Giese, Hamburg, Germany. Retort oven for recovering ammonia. An upper chamber containing decomposing retorts and gasifying retorts, a lower chamber with air and gas tubes to supply a combustible mixture to said upper chamber, and means for carrying the products of combustion back through the lower chamber to heat said air and gas tubes.

672,156. Hermann Vieth, Ludwigshafen, Germany. Assignor to Knoll and Co., same place. Salicylglycollic acid. The crystals melt at 132° C., show nearly parallel extinction of polarized light, and react in solution red-violet with ferric chloride, dissolve without decomposing in sodium hydroxide, but on heating in caustic alkalies or acids they decompose. Made by saponifying its ethers below 100° C.

672,192. George MacDonald, London, England. Two-thirds assigned to F. E. Bristow, same place, and W. R. Renshaw, Stoke-on-Trent, Staffordshire, England. Filtering material. Heats ferric oxide in thin layer in closed retort, injects a definite amount of liquid petroleum residue below the oxide at one end, where it is converted into a reducing gas which is drawn off at the opposite end above the oxide, the latter being thus made homogeneous non-crystalline ferrosoferric oxide (Fe_3O_4).

672,210. Carl Enoch, Hamburg, Germany. Making silico-

Digitized by Google

fluorides. Treats dilute waste aqueous solutions containing hydrofluoric acid with sand and solid sodium chloride whereby gelatinous sodium silicofluoride is deposited.

672,350. Emil Bronnert, Dornach, Max Fremery and Johann Urban, Dremmen, Germany. Making cellulose solutions for thread. Artificial silk. Saturates aqueous ammonia of 16 to 18 per cent. strength, with cupric carbonate at —5° to 5° C., and dissolves cellulose therein.

APRIL 23, 1901.

672,541. Adolph Spitteler, Frien, Germany. Solid transparent Paranucleo-proteids. Adds to an impure paranuclein proteid caustic alkali in excess of what is required to dissolve it, thereby forming a precipitate and clear solution above the same, separating them, and treating the clear solution to obtain the solid product by evaporation.

672,637. Sherard C. Cowper-Coles, London, England. Assignor to the Cowper-Coles Metal Extraction Co., Limited. Mellanear Haeyle, England. Process of treating zinc-bearing ores. Crushes, screens, roasts, and leaches with weak sulphuric acid to get zinc and copper, then passes the solution of mixed sulphates through a body of carbon and an electropositive metal for copper, and electrolyzes the remaining solution for zinc, the solution is then returned to the leaching vats.

672,991. Sergey D. Smolianinoff, Washington, D. C. Explosive. Nitroglycerin, empyreumatic oil, and oil of mirbane.

APRIL 30, 1901.

673,057. August J. B. Kochs, Chicago, Ill. Baking-powder. Monocalcium phosphate and the insoluble calcium phosphate of the formula $Ca_3H_2P_2O_8$.

673,070. Harvey W. Wiley, Washington, D. C. Assignor to the Marsden Company, Philadelphia, Pa. Smokeless powder. Nitrated natural pith of cornstalk, nitrated lignocellulose, and nitrated pentosans.

673,079. Felix Herwig, Elberfeld, Germany. Assignor to Farbenfabriken of Elberfeld Co., N. Y. City. Disazo dye. Combines 1 molecule of a diazotized aromatic amine with 1 molecule of a β-amino-α-naphthol-β-sulphonic acid; secondly rediazotizing the resulting aminoazo compound, and finally coupling the disazo compound thus obtained with an aminonaphtholsulphonic acid. Dyes unmordanted cotton from bluish red to bluish black shades fast to light. The sodium salt is a dark powder with metallic luster, soluble in water and ammonia with violet color changing to blue-violet on adding sodium carbonate, scarcely soluble in hot hydrochloric acid, but soluble in strong sulphuric acid with blue color.

673,092. Max A. Siegfried, Leipzig, Germany. Assignor to

Digitized by Google

Chemische Fabrik von Heyden, Actien Gesellschaft, Radebeul, Germany. Process of making peptone. Saturates a crude solution of peptones with an albumose precipitating salt, zinc sulphate and sulphuric acid, treats filtrate with sulphuric acid and a concentrated solution of such a salt, filters, neutralizes, adds a ferric salt then an earthly alkali which is precipitated from the resulting solution by a suitable agent, and the solution is then evaporated at a low temperature.

673,275. Charles R. Long, John S. Miller, and William F. Ingram, Louisville, Ky. Composition for street paving, etc. Bituminous sandstone, magnesium material and terra alba, serpentine, etc.

673,328. Jean V. Skoglund, Bayonne, N. J. Salt mixture for explosives. Dissolves sodium nitrate and ammonium sulphate in water, crystallizes, filters, adds a precipitant for sulphuric acid as a sulphate, which is removed and the liquor evaporated.

673,347. Harvey W. Wiley, Washington, D. C. Assignor to the Marsden Co., Philadelphia, Pa. Making explosives. Comminutes vegetable pith, adds a solution of nitroglycerin in a volatile liquid, and removes latter by evaporation.

WM. H. SEAMAN.

Digitized by Google

REVIEW OF AMERICAN CHEMICAL RESEARCH.

VOL. VIII. No. 2.

WILLIAM A. NOYES, Editor.

REVIEWERS:

M. T. Bogert, Benton Dales, W. F. Hillebrand, D. W. May, A. A. Noyes, W. H. Seaman, E. M. Chamot, L. M. Dennis, L. P. Kinnicutt, H. N. McCoy, J. W. Richards, J. O. Schlotterbeck, B. S. Cushman, A. H. Gill, H. W. Lawson, C. J. Moore, S. P. Sadtler, F. P. Underhill.

INORGANIC CHEMISTRY.

Pictet's Oxygen Separation Process. *Sci. Am. Sup.*, 52, 21,692; also *Eng. Mag.*, 22, 144.—These papers contain descriptions (taken from London Engineering) of Pictet's proposed process of separating the oxygen of the atmosphere from the nitrogen. The method is based upon the possibility of effecting a separation of the constituents of liquid air by fractional distillation, owing to the fact that the boiling-point of nitrogen is twelve degrees lower than that of oxygen.

In the evaporation of the liquid air, the heat absorbed is taken from a counter current of air flowing through coils of pipe around which the cold gases circulate in passing from the stills. This inflowing current is supplied at a pressure of 40 lbs. per square inch. It is, therefore, completely liquefied.

The apparatus, as described, consists of a series of ten stills. These are cylindrical in form and are surrounded by the coils of pipe in which the interchange of temperature takes place. The diameter of a still and its interchanger coils is about four times its height. The ten stills form a compact vertical column.

The liquefied air produced in the interchanger coils, after passing through a filter which removes the solid carbon dioxide, flows into the topmost still. About one-tenth of the liquid evaporates in the first still. The remainder flows to the next still and so on. The gas from the first five stills is chiefly nitrogen. That from the sixth and seventh is of about the same composition as the atmosphere. The combined fractions from the last three stills contain about 55 per cent. of oxygen. The last fraction, if collected separately, contains over 90 per cent. of oxygen.

The loss of liquid air by the inflow of heat from the surroundings and by imperfect interchange of temperature is said to be fully compensated by supplying air at 30 to 40 pounds' pressure, while the exhaust takes place at atmospheric pressure.

Digitized by Google

It is estimated that a plant capable of treating 500 tons of air a day would produce 110 tons of 50 per cent. oxygen and one-fourth ton of solid carbon dioxide, by an expenditure of 700 horse-power. The cost of 50 per cent. oxygen is estimated at 3 cents per 1,000 cubic feet and 90 per cent. oxygen at 7 cents per 1,000. H. N. McCoy.

Liquid Hydrogen. By James Dewar. *Sci. Am. Sup.*, **52**, 21,690.—The article is an abstract of the authors Centenary Commemoration Lecture, at the Royal Institution 1899; published in the Report of the Smithsonian Institution for 1900. It deals with the physical and chemical properties of liquid hydrogen, and describes a number of experiments illustrating these properties.
H. N. McCoy.

New Researches on the Neutralization of Phosphoric Acid. By M. Berthelot. *Sci. Am. Sup.*, **52**, 21,681.—Upon adding a solution of calcium hydroxide to a dilute solution of phosphoric acid, primary calcium phosphate, soluble in water, is first formed; then with more calcium hydroxide secondary calcium phosphate precipitates. The author finds that if a large excess of calcium hydroxide, over that required for the secondary salt, be allowed to remain in contact with the precipitate the latter slowly absorbs more lime. After four days the absorption reached a maximum. The precipitate then contained 2 atoms of calcium to 1 molecule of phosphoric acid. The composition of the precipitate was deduced from analytical results obtained by mixing solutions of known strength and titrating the excess of lime in a measured volume of the filtered solution. Similar results were obtained by the action of barium hydroxide on phosphoric acid.
H. N. McCoy.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

The Geology of Ore Deposits. By C. R. van Hise. *Science*, **14**, 746–757 and 785–793.—A popular lecture delivered in August, 1901, complimentary to the citizens of Denver. This is in large measure a popular and forceful condensation of the speaker's views as given at length in "Some Principles Controlling the Deposition of Ores," *Trans. Am. Inst. Min. Eng.*, **30**, 1–151, 1900, views which have excited so much interest and discussion in the past year. The four following fundamental premises are first laid down and discussed: "(1) The chief class of ore deposits is segregated by underground water; (2) the source from which the water derives the metals is the zone of fracture; (3) the circulating underground water is mainly of meteoric origin; (4) the force which drives the water in its circulation is gravitative stress." Following this introduction is discussed the manner of underground circulation illustrated by instructive diagrams,

Digitized by Google

from which it appears that the theories of the descensionists, the ascensionists, and lateral-secretionists are all incomplete, but that they supplement each other and when thus harmonized are in accord with the author's theory of underground circulation. Then follows consideration of the causes of ore precipitation, which, instead of being credited chiefly to diminishing temperature and pressure of rising solutions, is ascribed more to the mingling of different solutions in trunk channels, whereby chemical precipitation is naturally induced, and to the precipitating influence of the wall rock upon these solutions.

The author next shows how unfounded in general is the time-honored belief in the "richness with depth" theory when a large unit of measurement—say 1000 feet is employed. While the upper 1000 feet may show great irregularity in richness the general trend is toward impoverishment with depth. In the exceptional cases where decrease in richness is not observed this is held to be due to the fact that the ore resulted from a single enrichment by ascending waters. The copper deposits of Lake Superior offer an example of unusual richness for this class. The cause of diminution with depth is held to lie in the effect of descending currents on deposits already formed by ascending currents. It is supposed that the contents of the upper part of the original vein become oxidized in the zone of weathering and are in considerable part carried down with the meteoric waters to be reprecipitated by chemical action of the sulphides (chiefly iron sulphide) lower down, or of the constituents of the wall rock or of the ascending solutions. The result is an enrichment of the vein for some distance, which enrichment progresses in depth with lowering of the water-level as erosion brings the upper portions of the vein within the zone of weathering. "It is held that the downward transportation of metals already in lodes is the most important of the causes explaining the character of the upper portions of ore deposits and that their peculiar characters are certainly due to the effect of descending currents."

The effects of ascending and descending currents may be simultaneous, in which case the former alone will be exerted below and the latter above, while between there will be a belt in which both appear.

The principles presented lead to a new classification of the ore deposits produced by underground waters: "(*a*) Ores which at the point of precipitation are deposited by ascending waters alone. These ores are usually metallic or some form of sulphurets; but they may be tellurides, silicates, or carbonates. (*b*) Ores which at the place of precipitation are deposited by descending waters alone. These ores are ordinarily oxides, carbonates, chlorides, etc., but silicates and metals are exceptionally included. (*c*) Ores which receive a first concentration by ascending waters and a reconcentration by descending waters.... The materials of class *c* com-

Digitized by Google

prisee oxides, carbonates, chlorides, and rarely metals and silicates, above the level of ground-water, and rich and poor sulphurets, tellurides, metallic ores, etc., below the level of ground-water. At or near the level of ground-water these two kinds of products are more or less intermingled, and there is frequently a transition belt of considerable breadth." If this classification and its underlying theories are correct, their thorough study and understanding may often prevent the waste of millions in needless exploitation and exploration. W. F. HILLEBRAND.

The Reduction of Copper by Solutions of Ferrous Salts. BY H. C. BIDDLE. *J. Geol.*, 9, 430–436, and *Am. Chem. J.*, 26, 377–383.—The genesis of great copper deposits has generally been ascribed to the action of ferrous salts on solutions of copper compounds. After reviewing the rather unsatisfactory work of earlier experimenters seeking the proper conditions for this reduction the author makes the following statement, founded on theoretical considerations and his own experiments: "The precipitation of metallic copper by solutions of ferrous salts is a reversible reaction, whose direction in any case is determined by the relative concentration of the ferrous, ferric, and copper (cuprous and cupric) ions.

"(*a*) In a solution containing an appreciable quantity of ferric ions, or in which these would be formed in the course of the reaction, metallic copper will not be deposited.

"(*b*) In a solution containing few ferric ions, and in which the reaction does not result in their appreciable increase, a sufficient concentration of ferrous and copper ions will result in the deposition of metallic copper."

As showing the tendency of ferrous salts to reduce copper compounds from the cupric to the cuprous state the author cites the action of ammonium sulphocyanate on a solution of ferrous and cupric chlorides, of ferrous chloride on cupric oxide, and of ferrous hydroxide on cupric hydroxide in emulsion.

The influence of the concentration of the ions is illustrated by the following experiments: The greenish precipitate produced by a considerable excess of sodium carbonate in a solution of 1 molecule cupric chloride to 2 molecules ferrous chloride undergoes but slight change, owing to the decrease in the active masses of the ferrous and ferric ions due to the presence of the highly ionized alkali carbonate. If the latter is in but slight excess the precipitate slowly becomes brick-red from metallic copper and basic ferric carbonate, owing to the great lessening in the concentration of the carbonic acid ions. Because of the greater solubility of the acid ferrous and cupric carbonates over the normal and basic salts the conditions are much more favorable for the precipitation of copper even in presence of much alkaline bicarbonate. Since pressure increases the solubility of the acid carbonates, copper is readily reduced even in contact with strong

Digitized by Google

solutions of alkaline bicarbonates by the greater concentration thus obtained.

"The reduction of copper from the cuprous condition may be effected in the same manner as from the cupric."

W. F. HILLEBRAND.

The Andesite of Mount Sugarloaf, Boulder County, Colorado. BY HARRY HOGARTY. *Proc. Colorado Sci. Soc.*, **6**, March, 1899, 12 pages. **The Sunset Trachyte, Sunset, Boulder County, Colorado.** BY R. S. BREED. *Proc. Colorado Sci. Soc.*, **6**, June, 1899, 15 pages. **A Mica Andesite of West Sugarloaf Mountain, Boulder County, Colorado.** BY J. C. BLAKE. *Proc. Colorado Sci. Soc.*, **7**, 1–22, 1901.—These papers are in continuation of a series on the eruptive rocks of Boulder County (see abst. this Journal, **20**, 51), prepared under the direction of Prof. C. S. Palmer, of the University of Colorado, at Boulder. The andesite is composed of about 67 per cent. groundmass and 33 per cent. phenocrysts, the latter consisting of orthoclase, sanidine, plagioclase, hornblende, augite and another pyroxene, biotite, magnetite, apatite, titanite. In the somewhat altered Sunset trachyte the phenocrysts are chiefly sanidine and oligoclase (about 25 per cent. together) with subordinate apatite, magnetite, and sphene. Anatase, limonite, biotite, zircon, and augite are also found. The phenocrysts make up about one-third of the mica-andesite and consist of sanidine, labradorite, calcite, biotite, magnetite, kaolin, quartz, sphene, and apatite, named in order of abundance. Because of the altered character of the second and third rocks, the analysis of only the first is reproduced. SiO_2, 63.64; TiO_2, 0.43; Al_2O_3, 18.05; Fe_2O_3, 2.14; FeO, 1.80; MnO, 0.46; CaO, 3.36; MgO, 1.01; Na_2O, 3.65; K_2O, 4.73; P_2O_5, 0.18; H_2O, 1.07; S, trace. Total, 100.52. Sp. gr., 2.56. Sr, Ba, Li, Cl, F, and CO_2 absent. All the analyses were made mainly in accordance with the directions laid down in *Bull. No.* 148, *U. S. Geol. Survey*.

W. F. HILLEBRAND.

TRANS. KANSAS ACAD. SCI., VOL. 17, 1899–1900.

Experiments on the Relative Heating Power of Coal and Illuminating Gas. BY E. H. S. BAILEY. pp. 35–38.—A description of admittedly crude experiments by which the comparative heating power of the illuminating gas of the city of Lawrence as compared with coal from Leavenworth and Cañon City (Colo.) was obtained. As an average result of values ranging from 20,800 to 23,000, it was found that one ton of coal was equivalent to 21,500 cubic feet of gas of composition given, from which it is concluded that with coal at $2.50 per ton, the gas would have to be sold at 12 cents per thousand in order to be equivalent in cost to coal, but that in some of the natural gas districts, gas

Digitized by Google

could be furnished at this price. Its heating power, however, is much less than that of illuminating gas.

The Atchison Diamond-Drill Prospect Hole. By A. E. Langworthy. pp. 45–52.—This paper includes proximate analyses of the coal cores brought up from depths of between 1100 and 1200 feet beneath the city of Atchison, showing it to be "second only to the Cherokee County coal, and as a gas coal superior to that."

Analyses of the Mississippian (Subcarboniferous) Limestone from the Atchison Prospect Well. By Fred B. Porter. p. 52.—These analyses show from 93.68 to 94.84 per cent. calcium carbonate.

Analysis of Magnesia Water Found near Madison, Kansas. By F. W. Bushong. p. 53.—This well-water contains 4712 parts per million of solids, including 1903 $MgSO_4$, 1380 Na_2SO_4, 830 $CaSO_4$, and 396 Na_2CO_3.

The Muscotah Artesian Wells. By E. B. Knerr. pp. 53–54.—Along the base of the east bluffs of the Grasshopper valley, 1½ miles south of Muscotah, is a series of low marshy mounds from 5 to 10 feet high and in one case 15 yards wide and 60 long. The water springs from the whole surface of the mounds and when brought up by a pipe sunk near the base of one of them gave a flow of above a gallon a second of clear, cold, and palatable water containing 48.2 grains of salts per U. S. gallon, consisting chiefly of the bicarbonates of calcium (27.4), magnesium (5.2), and iron (6.5), with lesser amounts of alkali and magnesium sulphates.

Water-Supply from a Sanitary Standpoint. By F. O. Marvin. pp. 54–66.—A lecture delivered before a special meeting of the Academy at Topeka, January 25, 1901.

The Americus Limestone. By Alvan J. Smith. pp. 189–190.—Contains a very rough analysis of this rock, showing $CaCO_3$, 75, $MgCO_3$, 6, aluminates and $FeCO_3$, 12, silica, 6.

Kansas Mines and Minerals. By G. P. Grimsley. pp. 200–207.—A review in the form of a lecture of the coal, gas, oil, lead, zinc, salt, gypsum, clay, cement, and building-stone resources of the state.

A Theory of the Cosmos. By E. B. Knerr. pp. 20–28.—An address in which the old theory of the discontinuity of the ether is upheld and an attempt is made to explain gravitation and the formation of atoms and molecules by the initial energy of the etheric protatoms. W. F. Hillebrand.

Variation of Texture in Certain Tertiary Igneous Rocks of the Great Basin. By J. E. Spurr. *Jour. Geol.*, 9, 586–606.—

Digitized by Google

"In the Great Basin, particularly in Nevada, we have tertiary extrusive rocks which show transitions from a granular structure with glassy groundmass. The different phases are often intimately associated, and structural analysis shows that the differences of crystallization which brought about these variations were slight, a relatively small decrease of the rate of cooling being sufficient to allow the formation of the holocrystalline instead of the porphyritic structure." As a result of his detailed study of the subject, the author concludes that a granular rock is not necessarily a deep-seated one in the formerly accepted sense of the word, that the more important structures are not peculiar to particular rocks, but that the glassy, fine porphyritic, coarse porphyritic, ophitic, aplitic, and hypidiomorphic granular structures may occur in any rocks. Three pairs of analyses by H. N. Stokes of some of the rocks studied are given: Hornblende-biotite-quartz-diorite, hornblende-quartz-andesite; biotite rhyolite, silicious granite; silicious rhyolite, biotite granite.

W. F. HILLEBRAND.

The Pre-Terrestrial History of Meteorites. BY O. C. FARRINGTON. *Jour. Geol.*, **9**, 623–632.—The author presents certain deductions, based on the facts accumulated in his studies for Students (abst., This Journal, **23**, 140; **24**, 8), which led him by a different process of reasoning to the hypothesis of Boisse as elaborated by Meunier that meteorites owe their origin to a shattered globe. There are no analytical data.

W. F. HILLEBRAND.

Mineral Resources of the United States, 1899. *Part* **6**, *of the 21st Ann Rep. U. S. Geol. Survey*, 1899–1900.

Iron Ores, pp. 31–67. BY JOHN BIRKINBINE.—In addition to the usual statistical information, there are given 284 cargo analyses of Lake Superior ores.

Aluminum and Bauxite, pp. 267–271.—This article contains a brief statement of some of the new uses for aluminum: electrical conductors, reducing agent for oxides of Cr, Ti, Wo, Va, Mo, etc., flash lights, paint, scientific instruments, etc., in alloy (magnalium) with 10–25 per cent. magnesium.

Quicksilver, pp. 273–283. BY EDW. W. PARKER.—In this we find excerpts from a report by H. W. Turner on the new producing region in the Great Bend of the Rio Grande River in Texas. The limestone carrying the cinnabar is at least 1000 feet in thickness, and as the quicksilver undoubtedly came from a source beneath the limestone it is probable that this will be ore-bearing throughout its depth and that ore deposits may be found still lower. The mineralized area is limited—4 to 5 miles by 2 to 3 miles. [In the report for 1900 this is increased to a length from east to west of 8 miles.] The ore occurs as stringers

Digitized by Google

or pockets in brown veins of calcite and iron oxide. Besides cinnabar, there occur native mercury, calomel, and greenish crystals of an oxychloride of mercury which will be examined by Prof. Penfield and for which Mr. Turner suggests the name terlinguaite.

Tungsten, Molybdenum, Uranium and Vanadium, pp. 299–318. By J. H. Pratt.—This paper is chiefly a summary of the sources, occurrence, and growing uses of these elements. Their various minerals are enumerated and analyses—chiefly by the reviewer—of uraninites, gummite, uranophane, and carnotite are reproduced. Following this is a note of *An Occurrence of Tungsten Ore in Eastern Nevada*, by F. B. Weeks. Hübnerite is mined there on a small scale.

Mineral Resources of the U. S., 1899. *Part* 6, (*Continued*) *of the 21st Ann. Rep. U. S. Geol. Survey*, 1899–1900.

Petroleum, pp. 1–292. By F. H. Oliphant.—This exhaustive review is crowded with statistical tables relating to the petroleum of this and all foreign producing countries. It contains an extract by F. C. Thiele from the *Oil Paint and Drug Reporter*, giving analyses of Corsicana and Sour Lake petroleums of Texas, and a series of extracts taken from a report by W. L. Watts in the *Bull. Calif State Min. Bur.* In this are given the results of distilling California petroleums, and a comparison of the ultimate analysis of oil from California, West Virginia, and the Eastern States, also a comparative table of fuel values for California oils and Nanaimo coal.

Portland Cement, pp. 393–405. By S. B. Newberry.—Analyses are given of cement-marl and clay found at Bristol, Indiana, of clay, etc., from Michigan, marl-clay from Tongue River, North Dakota, and limestone and clay from Wellston, Ohio.

American Rock Cement, pp. 407–411. By Uriah Cummings. —Contains an analysis of natural rock cement from Chattanooga, Tennessee, derived from a bed of enormous extent and great uniformity of composition.

Precious Stones, pp. 419–462. By Geo. F. Kunz.—Under Diamond, are reproduced from a paper by Hussak two analyses of titaniferous pebbles (favas) found in the Brazilian diamond sands. Recent papers on the source and origin of the diamond are briefly reviewed. Interesting reviews and comments are made on the corundum occurrences of North Carolina, California, Canada, and India. Analyses showing rather high fluorine of Omi topaz from Japan are reproduced from a paper by Prof. Jimbo.

Sulphur and Pyrites, pp. 503–519. By Edw. W. Parker.—Largely statistical but containing descriptions of the methods employed in Sicily for the reduction of sulphur, these being taken from consular reports.

Digitized by Google

Fuller's Earth, pp. 589–592.—In addition to brief statistics there is a short statement of the development of the industry in the United States, in which it is said that "the earth discovered in South Dakota is almost the exact duplicate of the English earth." The ways of using the domestic product for refining mineral oils and the English for vegetable oils are outlined, and we read that for such a mixture of oils as crude petroleum, the filtration effects not only a decolorization but also a remarkable separation of oils of different density, almost comparable to the results of fractional distillation. W. F. HILLEBRAND.

On Pyrite and Marcasite. By H. N. Stokes. *Am. Jour. Sci.*, [4], **12**, 414–420.—A condensation of *Bull. U. S. Geol. Survey*, No. 186, already abstracted in this Journal.
W. F. HILLEBRAND.

The Veramin Meteorite. By H. A. WARD. *Am. J. Sci.*, [4], **12**, 453–459.—This siderolite, placed by Meunier in his type of logronite, was seen to fall in Northern Persia, in 1880, and was partially described by Brezina in 1881. Mr. Ward visited Teheran, photographed the stone, weighing about 52⅔ kilograms, and was allowed by the Shah to remove a considerable fragment which is now on deposit in the American Museum of Natural History in New York. A polished section resembles the Miney meteorite of Taney Co., Missouri. Dr. G. P. Merrill finds, in a portion submitted to him, enstatite, olivine, possibly peckhamite, and a feldspar which may be bytownite or anorthite. Mr. J. E. Whitfield reports as to its composition that the portion analyzed by him was made up of 42.3 mineral matter and 57.7 metal. The latter, regarding all insoluble as mineral matter, contains iron, 92.06; nickel, 6.96; cobalt, 0.73; phosphorus, 0 10; sulphur, 0.15. Specific gravity of the whole, 4.57; of the metallic portion, 5.56 W. F. HILLEBRAND.

A New Stony Meteorite from Allegan, Michigan, and a New Iron Meteorite from Mart, Texas. By GEO. P. MERRILL AND H. N. STOKES. *Proc. Washington Acad. Sci.*, **2**, 41–68, 1900. Six Plates.—The stone which fell July 10, 1899, and probably weighed 70 pounds originally, is extremely friable but beautifully fresh. At close view it consists of chondrules, iron, and dark gray, ashy groundmass, and presents features indicative of tuffaceous origin. In opposition to Ward (*Am. J. Sci.*, **8**, 414, 1899), the stone is declared to be essentially non-feldspathic, notwithstanding the presence of alumina and alkalies. It approaches Brezina's group 29, Kügelchen-chondrite (C^c). Detailed analyses by Stokes show 23.06 metallic matter, and 76.94 stony matter, the latter including 5.05 troilite and about 1.3 chromite. Imperfectly purified chromite gave: 50.31 Cr_2O_3; 9.67 Al_2O_3; 28.78 FeO; 2.76 MgO; 1.20 TiO_2. Sp. gr. of the stone, 3.905

Digitized by Google

at 27°. In a supplementary note Dr. Merrill calls attention to certain points bearing on the origin of meteorites of fragmental character like that of Allegan.

The iron meteorite weighed, when found in 1898, 15¾ pounds, and exhibited when etched unusually perfect figures. It belongs to the octahedral variety and resembles so closely the Hamilton County iron as to suggest a common source for both, though the chemical data do not seem to indicate this. Analysis by Stokes gave: Fe, 89.68; Ni, 9.20; Co, 0.33; Cu, 0.037; P, 0.158; S, 0.017; chromite and Fe_2O_3, traces. Total, 99.422.

W. F. HILLEBRAND.

On a Stony Meteorite Which Fell Near Felix, Perry Co., Alabama, May 15, 1900. BY GEO. P. MERRILL. *Proc. U. S. Nat. Mus.*, **24**, 193–198. 1901. Two Plates.—A fine grained tuffaceous stone with numerous small dark chondrules and showing to the unaided eye no visible metallic iron. Soft and friable, approaching in appearance the stone of Warrenton, Mo., and in lesser degree that of Lancé, France. Olivine, enstatite, augite, troilite, and native iron are the essential constituents besides an irresolvable base. Its most striking feature is the occurrence of almost amorphous areas, reminding of the amorphous chondrules of the Grosnaja stone, but presenting features which suggest a different origin. The stone belongs to the Kügelchen-chondrites of Brezina and the Ornanites of Meunier, and will be known as the Felix meteorite. The mineralogical composition deduced from Dr. P. Fireman's analysis is: Metal, 3.04; troilite, 4.76; chromite, 1.17; graphite, 0.36; soluble silicate (olivine in part), 72.60; insoluble silicate (enstatite and augite in part), 18.07. Specific gravity, 3.78 at 30°. W. F. HILLEBRAND.

The Petroleum Fields of Wyoming, II. The Oil Fields of Fremont County. BY W. C. KNIGHT. *Eng. and Min. Jour.*, **62**, 628–630.—The geology so far as known of the five oil fields of this county is described; the physical properties of the oils are given, as also results of fractional distillation (by E. E. Slosson) of the oils from the Popo Agie and Lander fields. Although not far apart, and on the same anticlinal fold, "The Popo Agie oil has an asphalt base and contains considerable sulphur, while the Lander oil has a paraffin base and contains little or no sulphur. The Lander oil is very light (0.8565 sp. gr.) and will refine into a large percentage of kerosene with little or no heavy oils." Heating power of crude oil, 10,883 cal. per gram. The density of the fresh Popo Agie oil is 0.9, and its heating power 10,437 cal. The products of its refinement, properly manipulated, should be 35–45 per cent. of gasoline and kerosene, besides heavy and excellent lubricating oils, marketable asphaltum, and a certain undetermined amount of paraffin. A great future is predicted for

Digitized by Google

some of the undeveloped fields. A map accompanies the paper.
W. F. HILLEBRAND.

Texas Petroleum. BY WM. B. PHILLIPS. *Univ. of Texas Mineral Survey Bull.*, No. 1, 102 pages, July, 1901. This, the first publication of the recently organized University of Texas Mineral Survey, covers the work of only the first two months of its organization and is hence necessarily in part a compilation of the work of others. Many of the physical and chemical data concerning Texas oils, however, emanate from the chemists of the Survey, Messrs. Harper, Palm, and Worrell.
W. F. HILLEBRAND.

The Diamond Deposits of Salobro, Brazil. BY F. DE PAULA OLIVEIRA. *Eng. and Min. Jour.*, **62**, 635–636.—A description of this once rich region, which the author expects to yet yield large store of gems. As a result of his own and others' observations he concludes "that diamantiferous regions may present a very different appearance from those characteristic of Diamantina, Grao Mogol, etc. The barren and unproductive aspect of a country formed of itacolumite marl and quartzite is not necessarily an indication of the presence of diamantiferous deposits . . ." He believes that the presence of certain conglomerates or breccias is one of the most important indications of the probability of their presence.
W. F. HILLEBRAND.

Report of the Bureau of Mines, Ontario. 1901, 236 pages. Among the contents of this report, the tenth of its kind, may be mentioned: *The Vermilion River Placers*, pp. 151–159, by A. P. Coleman; *Iron Ores of Nipissing District*, pp. 160–180, by W. G. Miller; *Iron Ranges of the Lower Huronian*, pp. 181–212, by A. P. Coleman; and *Iron Belt on Lake Nipigon*, pp. 212–214, by J. W. Bain. Scattered through these papers are a few analyses.
W. F. HILLEBRAND.

Guide to the Study of the Collections in the Section of Applied Geology, The Non-Metallic Minerals. BY GEO. P. MERRILL. *Rep. U. S. Nat. Mus.*, for 1899, pp. 155–483, with 30 plates.—This volume, issued in 1901, contains a fund of information on the occurrence, chief characters, composition, and uses of those minerals which are utilized in other than metallic forms. Typical analyses are frequent, and at the end of each subject appear important bibliographic references.
W. F. HILLEBRAND.

First Biennial Rep. Geol. Survey, North Dakota. 1900. 103 pages. BY E. J. BABCOCK. After a brief account of the topography and geology of the state, follow chapters on the clays of economic value, coal and water. Partial analyses made at the State University are given of a number of brick, fire and potters

Digitized by Google

clays, of lignites, and waters (well and others), accompanied for comparison by many analyses of clays and coals of repute from elsewhere in this country and Europe. The lignites are characterized as high-grade. In 26 samples analyzed in 1900, the average proportions of fixed carbon, and ash, after drying, were 52.08 per cent. and 7.59 per cent. The averages for 19 older analyses of air-dried coals were 44.08 per cent. and 7.15 per cent. Sulphur is said to average 0.34 per cent.

W. F. HILLEBRAND.

Explorations in Alaska in 1898. *U. S. Geol. Surv. 20th Ann. Rep.*, Part 7. This volume is made up of five reconnaissance reports by Messrs. Eldridge, Spurr, Mendenhall, Schrader, and Brooks. In that by Eldridge appear analyses of four coals from the Tyonek field and five reproduced analyses of coals from Kachemak Bay on Cook Inlet. Spurr reports two analyses of coal from Controller Bay and Icy Bay and one of an andesite-oligoclase-scapolite-biotite rock from the Yentna River 12–15 miles above its junction with the Sushitna. Schrader gives a few assays of copper ores, from Latouche Island, in the main, and Brooks ten of quartz specimens from the Tanana River.

W. F. HILLEBRAND.

METALLURGICAL CHEMISTRY.

Glossary of Mining and Smelting Terms in Spanish and English. By J. D. ROBERTSON. *Min. and Met.*, November and December, 1901.—A very complete collection, recommended to the attention of metallurgists, miners and chemists.

J. W. RICHARDS.

Prospecting in Western Mexico. By T. S. DELAY. *Eng. Mag.*, November, 1901.—An entertaining account of how a prospector should be equipped. The writer's method of prospecting is to work up the beds of water-courses, looking for mineralized float. Failing to find it there, he goes along the hillside, about half way up, turning over and breaking any promising bit of rock; failing there, he works along the crest where the rock is in place; if none of these localities show any mineral indication, he passes on. If a piece of mineral is found, the amount and character of the attrition will give evidence of how far it has traveled, and the comparative amount of oxidation on the surface and interior of the fragment will give indication of the time since it was fractured from the ledge. J. W. RICHARDS.

The Mexican Meeting of the American Institute of Mining Engineers. EDITORIAL CORRESPONDENCE. *Eng. and Min. J.*, November 30, 1901.—A long, well-written and well illustrated

Digitized by Google

account of the general features of the meeting and the parts of Mexico visited *en route.* J. W. RICHARDS.

Gems and Precious Stones of Mexico. BY GEORGE F. KUNZ. *Eng. and Min. J.*, November 30, 1901, American Institute of Mining Engineers.—Abstract of a paper giving full and interesting details of the different varieties of gems and precious stones found in Mexico. The only gem stone at present systematically mined is the opal; the only important ornamental stone is tecali, or so-called Mexican onyx. J. W. RICHARDS.

The Sierra Mojada, Coahuila, Mexico, and Its Ore Deposits. BY J. W. MALCOLMSON. *Eng. and Min. J.*, November 30, 1901. Paper read before American Institute of Mining Engineers.—A long paper treating of the history and development of the Sierra Mojada mines in Northern Mexico, the character and extent of the ore deposits and the methods of mining the ore.
J. W. RICHARDS.

The Australian Mining School. *Eng. and Min. J.*, November '30, 1901.—Description of the chemical and metallurgical laboratories and ore-dressing plant of the Mining School of Sydney University. J. W. RICHARDS.

The Mining Industries of Mexico. BY H. L. GEISSEL. *Min. and Met.*, November 1, 1901.—A well-illustrated and entertainingly-written general account of the subject.
J. W. RICHARDS.

The Cripple Creek Mining District. BY. DR. S. F. HAZLEHURST. *Min. and Met.*, November 1, 1901.—A brief description of the present status of that camp. Of interest is the statement that in the principal mines the average value of the ore raised has been steadily increasing, being $39.89 per ton in 1899, $44.79 in 1900, and $60.33 per ton so far during the present year.
J. W. RICHARDS.

The Mining Development of Gilpin County, Col. BY THOMAS TONGE. *Eng. Mag.*, November, 1901.—John Gregory first found gold in this county in Gregory Gulch, in 1859. In the small belt of territory, four miles long by three wide, of which Central City is the center, there are ten mines which have passed the million-dollar mark in production, and thirty-six of the leading mines have produced sixty million dollars. The ores are gold-bearing iron and copper pyrites, galena and zinc blende. The veins are true fissure veins, and vary in width from two to twenty feet. "The Gilpin County Concentrating Table" is a local invention which has superseded the Cornwall hand buddle. The best mills save as high as 90 per cent. of the values. Most of the smaller properties are being concentrated into large ownerships. J. W. RICHARDS.

Digitized by Google

The Iron Ores of Santiago, Cuba. By A. C. Spencer. *Eng. and Min. J.*, November 16, 1901.—The ores are almost pure magnetites, very low in both sulphur and phosphorus. They are being mined in three localities on the properties of the Juragua and Spanish-American Company. The iron-bearing rocks occupy a zone along the foothills or upon the southern slopes of the mountains, between a belt of granular diorite on the south and a series of volcanic flows on the north. The author discusses the theory of the formation of these deposits.

J. W. Richards.

The Pigholugan and Pigtao Gold Regions. Island of Mindanao, Philippine Islands. By J. Clayton Nichols. *Eng. and Min. J.*, November 9, 1901. American Institute of Mining Engineers, Mexico Meeting.—A reliable account, by a competent engineer, of two promising gold fields.

J. W. Richards.

The Ketchikan Mining District, Alaska. By Wm. T. Brewer. *Eng. and Min. J.*, November 16, 1901.—A discursive account of a region largely undeveloped.

J. W. Richards.

Gold Dredging in North Carolina. By Henry V. Maxwell. *Eng. and Min. J.*, November 2, 1901.—Dipper dredges of $\frac{3}{4}$ and 1 cubic yard capacity are the only types of machine used. They are invariably profitably operated. No details are given.

J. W. Richards.

Some Southern Exhibits at the Pan-American Exposition. By H. C. Brown. *Eng. and Min. J.*, November 2, 1901. A description of the exhibits, illustrating the mineral resources of Arkansas, Georgia, North Carolina, Alabama, Tennessee and Virginia.

J. W. Richards.

Mineral Features of Pahary, Malay Peninsula. By F. J. Stephens. *Eng. and Min. J.*, November 2, 1901.—Description of the geology of the district, and of the tin mines, which show 3 to 10 per cent of tin, and promise larger developments.

J. W. Richards.

Texada Island, British Columbia. By Wm. M. Brewer. *Eng. and Min. J.*, November 23, 1901. Describes the advantages of this island for a smelting plant for the many mines in the vicinity; also the mineral resources of the island itself.

J. W. Richards.

Coal and Iron in Cape Breton. *Eng. and Min. J.*, November 23, 1901.—It is computed that there are 5,500,000,000 tons of coal on the island, of good quality. Iron ore occurs in

Digitized by Google

large quantities; there are blast-furnaces, steel works and an Otto-Hoffman coke plant. The details given are meager, but interesting. J. W. RICHARDS

The Virgilia Copper District. BY L. N. WHITE. *Min. and Met.*, November 15, 1901.—Description of a district in Person county, N. C., and Halifax county, Va., its geology, veins and kind of ore. The vein material is quartz and altered slate, carrying massive copper sulphide, which is both auriferous and argentiferous. Concentrates show 48 per cent. of copper, 0.24 ounces of gold and 20.30 ounces of silver per ton. This ore was concentrated ten to one. The mines are deficient in proper concentrating apparatus and the producers handicapped by lack of smelting facilities. The article describes a dozen of the principal mines, with good illustrations. J. W. RICHARDS.

Mining Practice in Southeast Missouri. BY R. B. BRINSMADE. *Mines and Minerals*, November, 1901.—Description of the history and geology of that region; also of the methods of drilling, prospecting and developing new properties and shaft timbering. J. W. RICHARDS.

Geology of West Virginia. BY I. C. WHITE, State Geologist. *Mines and Minerals*, November, 1901.—A history and description of the different formations and the valuable minerals found in them. J. W. RICHARDS.

Old Time Mining in Mexico. BY O. H. HOWARTH. *Mines and Minerals*, November, 1901.—A very entertainingly written account of the ancient mines and how they were opened and worked. J. W. RICHARDS.

The Protection of Iron and Steel. *Eng. and Min. J.*, November 16, 1901.—The artificial graphite manufactured at Niagara Falls by the Acheson process promises to provide a most efficient paint for the protection of iron and steel structures, a requirement which is continually becoming more pressing.
J. W. RICHARDS.

The Snowshoe Mine, Boundary District, B. C. BY E. JACOBS. *Eng. and Min. J.*, November 23, 1901.—The ores are mostly worked on the surface; representative assays show 3.3 per cent. of copper, 1.6 ounces silver and 0.32 ounce gold per ton; value, $10.88. The article contains a description of the mine and method of mining. J. W. RICHARDS.

Locating Metals by Electricity. *Western Electrician*, November 16, 1901.—The principle of the method, invented by F. H. Brown, is to measure the electrical resistance of the ground between two terminals embedded in the earth, then to move one of these terminals proportional distances towards or away from

Digitized by Google

the other, when the presence of metallic veins in the ground between the terminals would be indicated by irregular changes of the resistance, and by successive tests the location of these good conducting veins could be found. The process is said to have been tested successfully in Dakota and in the Michigan copper mines. J. W. RICHARDS.

The Zinc and Lead Deposits of North Arkansas. BY J. C. BRANNER. *Eng. and Min. J.*, November 30, 1901, American Institute of Mining Engineers.—The paper describes their occurrence in beds, veins and as alteration products. The zinc ores are remarkably pure; in a large number of analyses of sphalerite the maximum iron was 0.67 per cent. Calamine is less abundant than sphalerite or smithsonite. "Tallow clay" or "buck fat" is a red, yellow, or brown mineral of greasy feel, found in nearly all the mines, in some in great abundance, and is a mixture of clay and calamine; no satisfactory means of smelting it has been devised. "Turkey fat" is a kind of smithsonite abundant at the Morning Star Mine on Rush Creek, which is simply smithsonite colored yellow by a little cadmium oxide. J. W. RICHARDS.

The Removal of Iron from Zinc Blende. BY DR. WM. B. PHILLIPS. *Eng. and Min. J.*, November 30, 1901.—Iron occurs in blende as pyrite, as chalcopyrite and as a molecular compound in the blende. By jigging alone, no satisfactory separation was obtained. By gently roasting and then passing over a magnetic separator at the rate of 4 tons an hour, ore with 48 zinc and 6.71 iron was brought to 58 zinc and 1.65 iron. Stronger roasting, or a faster or slower treatment in the separator gave poorer results. It is not necessary, to get the best results, to remove over one-third the sulphur by roasting. J. W. RICHARDS.

Chromite as a Hearth-Lining for a Smelting Furnace. BY WM. GLENN. *Eng. and Min. J.*, November 16, 1901. American Institute of Mining Engineers, Richmond meeting, 1901. Chromite is not attacked by the constituents or by any of the fusion products of copper ore: does not become friable by heating and cooling, and does not decrepitate when quickly heated. A cupola furnace bottom was filled in with lumps of Turkish ore containing 52 per cent. chromium oxide, and the interstices filled with fine ore. This bottom has lasted over two years to date. Similar blocks are used to line the slag line of the hearth furnaces and for the bridge wall, and appear indestructible for this purpose in the treatment of copper ores. J. W. RICHARDS.

Electrical Reduction of Chrome Ore. *Min. and Met.*, November 1, 1901.—A brief description, well-illustrated, of the plant of the Willson Aluminum Company at Holcomb's Rock, Va. Of the 8,000 H. P. available, 3,000 are utilized. The

Digitized by Google

chromium ores come from Australia and Asia Minor, and are reduced in electric furnaces to an iron-chromium alloy containing 70 per cent. chromium. This alloy is used in making armor-piercing shells and in armor itself. J. W. RICHARDS.

The Electrical Burner for Blast-Furnaces. BY F. L. GRAMMER. *Eng. and Min. J.*, November 9, 1901, American Institute of Mining Engineers, Mexico Meeting.—The electric arc was used on a furnace at Cleveland, O., to open up chilled tuyéres and cinder-notch. Using a current of 500 ampéres, with a carbon 6 feet long, attaching the other pole to a pipe feeding a cooling block, a hole was burned through 18 inches of cold iron in five minutes. Permanent wires are now strung at these furnaces, and a 110 kilowatt generator supplies the power necessary. J. W. RICHARDS.

Blast-Furnace Gas Engines in Austria. *Iron Age*, November 21, 1901 (from *Iron and Coal Trade Review*).—Description of the first tandem motor driven by blast-furnace gas, the first of such engines to be put into operation in Austria. It is at Königshof, Bohemia, is of 300 H. P., and made by the Machinenbau, Ak. of Prague, on the Cockerill type. The gas is cooled and purified from dust to the extent of 0.6 gram per cubic meter, which has caused no damage to the cylinder in two months' working. This engine is used for electric lighting purposes, but the company is putting in another for blowing purposes. J. W. RICHARDS.

Ore-Handing Plant of the Carrie Furnaces at Homestead. BY W. L. COWLES. *J. Assoc. Eng. Soc.*, October, 1901. An ore tipple picks up the loaded cars and dumps their contents into bins at a maximum rate of a 60-ton car every two minutes, or 18,000 tons of ore per day of ten hours. From the bins the ore is dropped into steel buckets loaded on a car, which then runs to the furnace, where the buckets are lifted off the car and the ore put into stock piles. Each bucket holds 10 tons of ore. Charging larries for the furnaces are filled directly from the bins or the stock piles. J. W. RICHARDS.

Machine-Cast Foundry Pig Iron. BY A. L. COLBY. *Age of Steel*, November 30, 1901 (read before Philadelphia Foundrymen's Association).—Such pig is particularly advantageous in basic open-hearth furnaces, because of the absence of silica sand, while the combined carbon oxidizes more readily than graphite. There is no dispute concerning the "sand allowance" in weighing such iron. In the cupola, less lime and less fuel are required, and it melts more easily. The pigs are more uniform in composition, because of the mixing of the metal in the casting ladle. The chief objections of foundrymen are the bad looking fracture, and the difficulty of judging the quality by the looks, but chem-

Digitized by Google

ical analysis is the only safe guide in buying iron. Samples are taken by drilling with a wide angle blunt-pointed drill, 2 or 3 inches in diameter, with a slow feed. J. W. RICHARDS.

A Crystalline Sulphide in Pig Iron. BY A. A. BLAIR AND P. W. SHIMER. *Eng. and Min. J.*, November 9, 1901 (paper read before American Institute of Mining Engineers).—Certain pig irons give less sulphur when determined by evolution methods than by oxidation methods. Such irons are found also to contain invariably titanium, leading the authors to suspect titanium sulphide in them. This was proved by dissolving a mass of the iron slowly in dilute hydrochloric acid, and separating graphite from the residue by careful washing and use of Thoulet's solution. The titanium sulphide was thus obtained as brilliant, hexagonal scales of light bronze color, containing: Titanium, 62.82; sulphur, 22.64; carbon, 9.82; iron, 1.82. Total, 97.10. Vanadium is also present in small amount, and possibly nitrogen. No evolution method can determine the sulphur thus combined.

J. W. RICHARDS.

Steel Forgings for Factory Engines. BY H. F. J. PORTER. *Power*, November, 1901.—The increase in size of factories has necessitated stronger forgings. Hydraulic pressed nickel steel is the most satisfactory, but can only be furnished by the largest plants equipped with the heaviest of modern machinery. Annealing and oil-tempering are recommended, by which steel, showing 80,000 to 90,000 pounds' tensile strengh, 45,000 to 60,000 pounds elastic limit, and 40 to 50 per cent. contraction of area, is obtained. J. W. RICHARDS.

The Internal Strains of Iron and Steel and Their Bearing Upon Fracture. BY A. WINGHAM. *Age of Steel*, October 19, 1901 (paper read before the Iron and Steel Institute at Glasgow).—During slow cooling there is a certain amount of adjustment which should have taken place at one temperature handed down to the temperature immediately below. Hence, in the final condition of coldness, there exists in the metal from the first, a certain amount of latent effort to adjustment, and it may be held that this latent effort constitutes a potential disruptive force. The writer works up this thesis as the basis of a study of the internal strains in iron and steel. J. W. RICHARDS.

Improved Open-Hearth Process. *Am. Mfr. and Iron World*, November 28, 1901.—Wm. B. Hughes, of Philadelphia, has patented the process of charging and melting pig-iron in a basic open-hearth furnace, and then, while it is at a low temperature, pouring upon it a melted slag made of iron ore and lime, melted in a cupola furnace. This highly oxidizing slag desiliconizes and largely dephosphorizes the metal, after which reaction the

Digitized by Google

bulk of the slag is run off, leaving the bath comparatively bare, and the bath is then decarbonized and made into steel in the usual manner. J. W. RICHARDS.

An Electric Resistance Magnesia Crucible Furnace for Laboratory Use. By H. M. HOWE. *Eng. and Min. J.*, November 16, 1901, American Institute of Mining Engineers, Mexico Meeting.—A furnace consisting of a crucible embedded in a block of magnesia, covered by another block, and heated by a spiral of platinum wire wound around the outside of the crucible. Can be used for any temperatures below the melting-point of platinum; has been held at 1400° C. for two hours without any deterioration of the platinum. Pipes allow of filling the crucible with various gases. For temperatures up to 1200° C., nickel wire may be used. The platinum wire used is 0.04 inch in diameter, and costs $30 for a furnace. No details of strength of current used are given. J. W. RICHARDS.

Electric Furnace with Magnetic Field. *Elec. World and Eng.*, November 30, 1901.—M. Ruthenburg, of Philadelphia, proposes in a recent patent, to pass through a body of magnetic sand an electric current of sufficient volume to weld together the contiguous edges of the grains, thus forming a porous mass of pure ore without the use of any cementing medium or the introduction of any additional impurity. J. W. RICHARDS.

Electrochemical and Electrometallurgical Industry. Art. III. Progress in France. By J. B. C. KERSHAW. *Elec. Rev.*, November 23, 1901.—In copper refining there are only five works, in France, refining altogether nine tons of copper per day. Aluminum is made by the Heroult process at La Praz, utilizing 5,000 H. P., while Pechiney et Cie use 4,000 H. P. at St. Michel for aluminum and other electrochemical products. The output in 1900 was over 1,000 tons. Chlorates are made by Gall and Mortlaur's process at St. Michel, since 1893, the process being the electrolysis of alkaline chlorides with platinum electrodes in open cells at a temperature high enough to form chlorate. Corbin et Cie also make them at Chedde in Haute Savoie, since 1897, having 12,000 H. P. available, of which 9,000 were used in producing 4,500 tons in 1900. The calcium carbide industry has developed more in France than in any other European country. There are twenty-six carbide plants, with 5,000 H. P., but many are shut down because of overproduction. Alkali and chlorine has not made much progress. The Hulin process (similar in principle to the Acker process now being tried at Niagara Falls), was started in 1899 with 2,600 H. P. at Les Clavaux, near Grenoble, but was shut down in 1900. The Compagnie Generale d'Electrochimie uses 1,500 H. P. at Lamotte (Oise), and the Puthenin-Chalandre diaphragm process

Digitized by Google

will be operated in 1902. Ferro-alloys are being produced at La Praz, Clavaux, Bozel and St Michel by electric furnace methods. Ozone is made by the silent discharge only in connection with the manufacture of heliotropine and vanillin. The Verley ozonizer is used, and 10,000 kegs of these products are made at Courbevoie, near Paris, per annum. At a few textile works, bleaching liquid is electrically made, the Corbin cell being used on a large scale at Lancey (Isere). J. W. RICHARDS.

The Intercolonial Copper Plant in New Brunswick. BY DR. L. S. GRISWOLD. *Eng. and Min. J.*, November 23, 1901.—This company mines, at Dorchester, N. B., a series of bedded sandstones and conglomerates, carrying chalcocite and copper carbonates. A plant to treat 150 tons of ore daily has been erected. The ore is crushed fine, roasted, leached with sulphuric acid in vats of 50 tons' capacity, and the copper precipitated from the solution by electrolysis. This plant has produced the first refined copper made in Canada. J. W. RICHARDS.

Sand Castings of Copper. BY C. VICKERS. *American Machinist*, October, 1901.—Where high electric conductivity is not desired, the addition of zinc, phosphorus, or silicon secures sound castings. In castings for electrical machines, where it is highly important that the conductivity should be retained, antimony, phosphorus, silicon, arsenic, and aluminum all diminish the conductivity, but the best results are obtained by mixing 1 ounce pulverized silicon-aluminum bronze (Cowles alloy) with 1 ounce each of oxide of manganese, borax and niter, tie up in paper and put into 100 pounds of copper five minutes before pouring.
J. W. RICHARDS.

Improved Method of Manufacturing Copper, Yellow Metal and Naval Brass. BY H. J. MARTIN. *Age of Steel*, October 12, 1901.—Consists only in rolling the ingots of metal taken hot from the molds in which they are cast, without letting the ingots cool, by this means avoiding separate reheating.
J. W. RICHARDS.

Aluminum versus Copper. *Elec. World and Eng.*, November 9, 1901. The cost of aluminum conductors is 20 to 25 per cent. less than copper, and its value as scrap has the same proportionate value as copper. The Old Colony Street Railway Company in Massachusetts has used ten miles of such feed wire, which has given complete satisfaction, and they intend using it entirely in preference to copper. J. W. RICHARDS.

The Aluminum Works at Shawinijan, Quebec. *Western Electrician*, November 2, 1901.—The water-power plant was officially started October 19th. Half of the main plant is ready, consisting of three 6,000 H. P. turbines, operating under a

Digitized by Google

head of 125 feet, and two generators of 5,000 H. P. each are in place. The part started October 19th was the smaller power plant of two 3,000 H. P. water-wheels, each of these being directly connected to two direct current 1,000 kilowatt generators, delivering current at 300 volts. The reduction works of the Pittsburg Reduction Co., which uses this power for producing aluminum, stands 175 feet above the power station, and at a distance of 400 feet, being connected therewith by aluminum conductors strung in an enclosed passageway. The aluminum plant consists of a reduction building 46 by 276 feet, and 27 feet high; a warehouse 79 feet by 195 feet, and a furnace room 62 feet by 174 feet, and 20 feet high. This company operates by the Hall process, used also at Niagara Falls. The full capacity of this plant will be in the neighborhood of 1500 tons of aluminum yearly.

J. W. RICHARDS.

ORGANIC CHEMISTRY.

Some New Derivatives of Secondary Butyl Alcohol. BY JAMES F. NORRIS AND ERIK H. GREEN, *Am. Chem. J.*, **26**, 293–318.—Methylethylketone, obtained by the fractional distillation of commercial "oil of acetone," is soluble in about 8 parts of water, readily soluble in dilute acids, but nearly insoluble in alkalies. Subjected to the action of various reducing agents, no secondary butyl alcohol could be obtained by reduction in acid or neutral solutions, but only by reduction in alkaline solution, the best yield resulting from the action of sodium upon the moist ethereal solution of the ketone at low temperature. A mixture of a concentrated sodium hydroxide solution with aluminum shavings was an efficient reducing agent. Dimethylpinacone was found in most of the reductions where the secondary alcohol was produced. *Secondary Butyl Alcohol*, b. p., 99.7°–99.8° (corr.) at 756 mm.; sp. gr., 0.8078 at 20°/4°, 0.8223 at 0°/4°. Soluble in 8 parts of water at 20°. Scarcely attacked by sodium at 0°, slowly attacked at 15°, vigorously at 60°. With solid potash and carbon bisulphide, it yields a white crystalline compound. Attempts to split it into optically active constituents, by the growth of various organisms, failed. *Secondary Butyl Chloride.*—In preparing this halide by the action of hydrochloric acid gas upon the alcohol no chloride resulted in the absence of zinc chloride, a fact in opposition to the statement of Malbot and Gentil (*Ann. chim. phys.*, (6), **19**, 405), b. p., 67.3°–67.8° (corr.) at 767 mm.; sp. gr., 0.8707 at 20°/4°. With cold argentic nitrate, in alcoholic solution, a precipitate begins to form almost immediately; with aluminum chloride, hydrochloric acid is evolved and a red oil produced which is immediately decomposed by water. *Secondary Butyl Bromide.*—Heavy colorless fragrant liquid; b. p., 91.3° (corr.); sp. gr., 1.2507 at 25°/4°. Does not react with sodium or

Digitized by Google

silver even at its boiling-point. With cold alcoholic argentic nitrate, it gives a heavy precipitate at once. Attempts to prepare the cyanide from this bromide were unsuccessful. *Secondary Butyl Acetate*, b. p., 111.5°–112° (corr.) at 744 mm.; sp. gr., 0.8648 at 25°/4°, 0.8900 at 0°/4°. *Secondary Butyl Propionate.*—Fragrant liquid, b. p., 132°–132.5° (corr.); sp. gr., 0.8657 at 20°/4°. *Secondary Butyl Isovalerianate*, b. p., 163°–164 (corr.) at 752 mm ; sp. gr., 0.8482 at 20°/4°. *Disecondarybutyl Succinate*, fragrant liquid, b. p., 255.5°–256.5° (corr.) at 750 mm.; sp. gr., 0.9735 at 20°/4°. *Secondary Butyl Benzoate*, fragrant liquid, b. p., 234.5°–235.5° (corr.) at 757 mm.; sp. gr., 0.9945 at 25°/4°. *Disecondarybutyl(Dimethyl-3,4-Hexane)*, colorless liquid, odor like petroleum ether, b. p., 116°–116.2° (corr.) at 750 mm.; sp. gr., 0.7332 at 0°/4°, 0.7165 at 25°/4°. By the action of nitric acid upon this hydrocarbon a *Tertiary Nitro Derivative* was obtained as a fragrant heavy yellow oil, volatile with steam, and giving a red color with potassium hydroxide. The amount obtained was insufficient for purification and analysis. *Dimethylpinacone(dimethyl-3,4-Hexandiol-3,4)*, b. p. 205°–205.7° (corr.) at 752 mm.; m. p., 49°. Dissolves in water and in all organic solvents, but is insoluble in solutions of the alkaline hydroxides. Does not combine with water to form a hydrate. Sp. gr. of the liquid form 0.9529 at 25°/4°. Zelinsky and Krapivin (*J. Chem. Soc.*, London, **64**, 390 (abstracts)) regard the liquid and crystalline forms as stereoisomeric, but neither the crystals nor the liquid are optically active, and Norris and Green consider the two forms to be identical, slight traces of impurities preventing the liquid form from crystallizing. The corresponding bibromide could not be prepared from the pinacone. Crude dimethylpinacoline, dissolved in ether, is not reduced to an octane by the action of zinc and hydrochloric acid. B. R. Rickards and H. G. Johnson assisted in certain of the experiments.

The indices of refraction of these secondary butyl derivatives were determined by Prof. G. V. Wendell for the sodium ray, referred to air at 20°:

	n		Temp.
Secondary butyl alcohol	1.3949	at	25°.30°
Secondary butyl acetate	1.3866	at	25°.30°
Secondary butyl propionate	1.3938	at	25°.19°
Disecondary butyl succinate	1.4238	at	25°.25°
Secondary butyl chloride	1.3953	at	25°.20°
Secondary butyl bromide	1.4344	at	25°.25°
Dimethylpinacone	1.4521	at	25°.25°
Disecondary butyl	1.4038	at	25°.20°

M. T. Bogert.

On Triphenylmethyl. By M. Gomberg. *Ber. d. chem. Ges.* **34**, 2726–2733.—See this Journal (**23**, 496–502). Further experiments are recorded with triphenylmethyl and its peroxide. By adding acetone or ethyl formate to a concentrated

Digitized by Google

benzene solution of the hydrocarbon, it is separated in colorless crystals, melting at 125°–128°, which gradually turn yellow. It is a highly unsaturated substance, its solutions rapidly absorbing oxygen from the air with production of the peroxide, and reacting energetically with iodine. Cryoscopic molecular weight determinations, using naphthalene as solvent, gave results far above the theory for triphenylmethyl. The peroxide may be prepared direct from triphenylchlormethane, zinc, and oxygen. By the action of dry air upon the benzene solution of the crystalline triphenylmethyl, an amount of oxygen was absorbed greater than that required for the production of a dioxide. The author suggests that this may be due to the formation of volatile compounds richer in oxygen than the dioxide. M. T. BOGERT.

The Chemistry of the Purine Group. BY JAMES F. NORRIS. *Am. Chem. J.*, **26**, 463–469.—A brief review of our present knowledge of the subject, based mainly upon the article by Emil Fischer in the *Ber. d. chem. Ges.*, **32**, 435. M. T. BOGERT.

On Some Acetyl and Benzoyl Pseudothioureas. BY HENRY L. WHEELER AND TREAT B. JOHNSON. *Am. Chem. J.*, **26**, 408–418.—It has been shown that acylimidomonothiocarbonic esters, $RCON{:}C(OCH_3)SCH_3$, react with amines with production of acylpseudoureas, $RCON{:}C(OCH_3)NHR$, while phenylimidomonothiocarbonic esters, $C_6H_5N{:}C(OCH_3)SCH_3$, and the hydrazone of thiocarbonicethylester, $C_6H_5NHN{:}C(OC_2H_5)SC_2H_5$, do not behave in a similar manner. Experiments with acylimidodithiocarbonicesters now show that these substances yield acylpseudothioureas, $RCON{:}C(SCH_3)NRR'$, when treated with amines. These acylpseudothioureas appear to have no basic properties and do not combine with picric acid; with hydrochloric acid they give thiocarbamates, with alcoholic ammonia guanidine derivatives, with phenylhydrazine aminotriazoles. *Acetyldiisobutylthiolmethylpseudothiourea*, $CH_3CON{:}C(SCH_3)N(C_4H_9)_2$.—Yellow oil, b. p., 175°–177° at 22 mm. *Acetylphenylthiolmethylpseudothiourea*, $CH_3CON{:}C(SCH_3)NHC_6H_5$.—Long colorless needles (from alcohol), m. p., 82°–83°. *Benzoylparatolylthiolmethylpseudothiourea*, $C_6H_5CON{:}C(SCH_3)NHC_6H_4CH_3$.—Prisms (from alcohol), m. p., 130°. *Benzoyl-α-naphthylthiolmethylpseudothiourea.*—Balls of fine needles (from alcohol), m. p., 124°. *Benzoylmetanitrophenylthiolmethylpseudothiourea.*—Needle prisms, m. p., 71°–72°. *Acetyldiethylthiolethylpseudothiourea.*—Yellow oil, b. p., 162°–164°, at 21 mm. *Acetylmethylphenylthiolethylpseudothiourea.*—Colorless prisms (from petroleum ether), m. p., 66°. *Benzoyldiethylthiolethylpseudothiourea.*—Colorless rectangular prisms (from petroleum ether), m. p., 70°. *Benzoyldipropylthiolethylpseudothiourea.*—Yellow oil, b. p., 226°–229°, at 17 mm. *Benzoyldiisobutylthiolethylpseudothiourea.*—Oil, b. p., 234°–236°, at 21 mm. *Benzoylparatolylthiolethylpseudothiourea.*—Needle-like

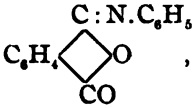
Digitized by Google

prisms (from alcohol), m. p., 93°. Heated with phenylhydrazine, it appears to give a *diphenylparatolylaminotriazole;* stout prisms (from alcohol), m. p., 225°–226°. *Benzoylpseudocumylthiolethylpseudothiourea.*—Fine needles (from alcohol), m. p., 83°–84°. *Benzoylparaanisylthiolethylpseudothiourea.*—Fine needle-like prisms (from alcohol), m. p., 99°–100°. *Benzoyldiphenylthiolethylpseudothiourea.*—Colorless prisms (from a mixture of petroleum ether and benzene), m. p. 142°. *Benzoylphenylthiolpropylpseudothiourea.*—Colorless prisms (from alcohol), m. p., 78°–79°. *Benzoylparatolylthiolpropylpseudothiourea.*—Colorless needles (from alcohol), m. p., 81°–81.5°. *Benzoylmetachlorphenylthiolnormalpropylpseudothiourea.*—Colorless prisms (from alcohol), m. p., 59°–59.5°. *Benzoylorthophenyleneguanidine,* $C_6H_5CON:C(NH)_2C_6H_4$.—Minute colorless prisms (from alcohol), m. p., 237°. Insoluble in chloroform, benzene, and water. *Diphenylene-di* (*Benzoylthiolethylpseudothiourea*), $(C_6H_5CON:C(SC_2H_5)NHC_6H_4-)_2$, from benzidine. Colorless needles (from a mixture of alcohol and benzene), melting at 179° with slight effervescence. Difficultly soluble in alcohol, chloroform, and benzene. With phenylhydrazine, a substance was obtained whose percentage composition corresponded with that of a *Ditriazole*; poor crystals (from alcohol, m. p., above 265°. *Dimethoxydiphenylenedi-* (*Benzoylthiolethylpseudothiourea*), from orthodianisidine. Minute colorless needles (from a mixture of alcohol and benzene), m. p., 170°–171°. *Benzoylphenylthiolbenzylpseudothiourea.*—This substance was prepared by four different methods, in the hope of getting structural or stereoisomers, but the product was found to be the same in all cases. Small colorless prisms (from alcohol), m. p., 116°–117°. Warmed with aqueous hydrochloric acid, it yields *Benzoylthiolbenzylcarbamate,* $C_6H_5CONHCOSCH_2C_6H_5$.—Colorless needle-like prisms (from alcohol), m. p., 141°–142°. Alcoholic ammonia reacted with the pseudothiourea to produce benzyl disulphide and *Benzoylphenylguanidine.*—The latter crystallizes from a mixture of benzene and petroleum ether in minute light yellow prisms, m. p., 90°–91°, soluble in alcohol and benzene. Its picrate crystallizes from alcohol in bright yellow prisms, m. p., 186°. *Benzoylphenylthiolmetaxylylpseudothiourea.*—Colorless prisms, m. p., 110°–111°. *Benzoyl-α-naphthylthiolmetaxylylpseudothiourea.*—Colorless flattened prisms (from alcohol), m. p., 133°. M. T. BOGERT.

Action of Aromatic Amines Upon Phthalyl Chloride at Different Temperatures. BY M. KUHARA AND M. FUKUI. *Am. Chem. J.*, **26**, 454-463.—Kuhara has observed the simultaneous formation of the symmetrical and unsymmetrical phthalimides by the action of ammonia upon phthalyl chloride (*Am. Chem. J.*, **3**, 26), and the present experiments were conducted with the object of preparing other unsymmetrical imides of this series, if possible.

Digitized by Google

By the interaction of ethereal solutions of aniline and phthalyl chloride at laboratory temperature, symmetrical phenylphthalimide results, identical with the ordinary phthalanil. If, however, the reaction is carried out at —5°, a white crystalline precipitate is obtained containing both the symmetrical and unsymmetrical forms, from which the latter may readily be separated on account of its greater insolubility in alcohol. *a-Phenylphthalimide*,



crystallizes in groups of microscopic white acicular crystals, insoluble in water, slightly soluble in alcohol, readily soluble in hot glacial acetic acid, m. p., 218°, by capillary tube method; 235°, by method of Kuhara and Chikashigé (*Am. Chem. J.*, **23**, 230). It may be changed to the symmetrical form by the action of heat. In a sealed tube, with water at 140°, it changes entirely to the symmetrical form, aniline, and phthalic acid; heated with alcoholic ammonia, part remains unchanged, part is decomposed to anilin and ammonium phthalate, while the symmetrical form, under similar conditions, yields ammonium phenylphthalamate. Phenylphthalamic acid was obtained by boiling the anil with baryta water and decomposing the barium salt with hydrochloric acid. The unsymmetrical imide does not yield this acid either when treated with baryta water or with alcoholic ammonia. *Oxyphthalylnitrosoaniline*, $HOOCC_6H_4CON(NO)C_6H_5$.—Obtained by the action of nitrous acid gas upon an ether solution of phenylphthalamic acid. Fine pale-yellow crystals, easily soluble in water or alcohol, less so in ether; decomposes in the air, exploded by heat or percussion. Boiled with water, it yields chiefly phenol and phthalic acid, with evolution of nitrogen and some nitrous acid and production of some symmetrical phenylphthalimide. *a-Orthotolylphthalimide*.—Beautiful silky needles (from alcohol), m. p., 201°. Insoluble in water, readily soluble in hot alcohol. May be changed to the symmetrical form by the action of heat. *Orthotolylphthalamic acid* and *oxyphthalylnitrosoorthotoluidine* were also prepared. The authors suggest that phthalyl chloride may appear in two different forms, the symmetrical form at ordinary temperatures and the unsymmetrical at low temperatures. M. T. BOGERT.

BIOLOGICAL CHEMISTRY.

The Chemical Constituents of Tendenous Tissue. BY LEO BUERGER AND WILLIAM J. GIES. *Am. J. Physiol.*, **6**, 220–231.—Analyses of the tendon Achilles of the calf and the ox, by the methods of Vandegrift and Gies (*Am. J. Physiol.*, **5**, 287) give the following composition:

Digitized by Google

Constituents.	Fresh tissue. Calf.	Fresh tissue. Ox.	Dry tissue. Calf.	Dry tissue. Ox.	Ash. Ox.
Water	67.51	62.870	....	....	....
Solids	32.49	37.130	....	....	....
Inorganic matter	0.61	0.470	1.880	1.266	....
Sulphur trioxide	....	0.031	....	0.840	6.65
Phosphorus pentoxide	....	0.039	....	0.106	8.34
Chlorine	....	0.147	....	0.397	31.37
Organic matter	31.88	36.660	98.120	98.734	....
Fat (ether, soluble matter)	....	1.040	....	2.801	....
Albumin, globulin	....	0.220	....	0.593	....
Mucoid	....	1.283	....	3.455	....
Elastin	....	1.633	....	4.398	....
Collagen (gelatine)	....	31.588	....	85.074	....
Extractives and undetermined substances	....	0.896	....	2.413	....

F. P. UNDERHILL.

The Action of Pilocarpine and Atropine on the Embryos of the Star-Fish and Sea-Urchin. BY ALBERT P. MATTHEWS. *Am. J. Physiol.*, 6, 207–216.—To sea-water containing either freshly fertilized eggs of the star-fish, *Asterias Forbesii*, or the sea-urchin, *Arbacia punctulata*, was added from 0.1 cc. to 2 cc. of a 0.5 per cent. solution of pilocarpine hydrochloride, or atropine sulphate. The eggs remained in these solutions during development. Out of a very large number of experiments the following conclusions were drawn: Atropine sulphate in small doses hinders the development of *arbacia* and *asterias* larvae and gives rise to dwarf embryos. Pilocarpine hydrochloride hastens the development of *asterias* larvae, and gives rise to abnormally large embryos. The action of atropine resembles that of hydrogen ions; the action of pilocarpine that of hydroxyl ions.

F. P. UNDERHILL.

An Analysis of the Influence of the Sodium, Potassium, and Calcium Salts of the Blood on the Automatic Contractions of Heart Muscle. BY W. H. HOWELL. *Am. J. Physiol.*, 6, 181–207.—Strips of the ventricular portion of the heart muscle of the terrapin immersed in an isotonic solution of sodium chloride give a characteristic series of beats. These spontaneous contractions of the heart depend upon the presence in the tissue of dissociable compounds of both calcium and sodium. If either is absent, automatic contractions are impossible. The influence of the potassium ion when present in physiological proportions is shown by a slowing of the rhythm. Under the combined influence of calcium, sodium, and potassium the automatic contractility is maintained for longer periods than by the action of sodium or calcium alone.

F. P. UNDERHILL.

On the Behavior of Epinephrin to Fehling's Solution and Other Characteristics of this Substance. BY JOHN J. ABEL. *Bull. Johns Hopkins Hospital*, 12, 337–344.—Epinephrin in its

Digitized by Google

native state easily reduces silver nitrate and other metallic salts but fails to reduce Fehling's solution. On being treated with hydrogen sulphide or with hydrochloric acid and tin in the proper medium, or on saponification of its benzoyl or acetal derivative in the autoclave, it becomes an energetic reducing agent for Fehling's solution, and this change in respect to copper sulphate is accompanied by an alteration in other properties. The substance is now not so easily oxidized on addition of dilute ammonia, and is more easily crystallized. The commercial preparation known as adrenalin also reduces copper sulphate. Reduced epinephrin has approximately the empirical formula $C_{10}H_{11}O_3$, and is capable of taking up four acid radicals. Potassium benzene thiosulphonate ($KS.SO_2C_6H_5$) added to a solution of epinephrin fixes the emerald-green color, which appears on the subsequent addition of ferric chloride. A colorimetric quantitative method may be based upon the reaction.

F. P. UNDERHILL.

On the Effect of Oxygen Upon Animal Life. BY J. T. WILLARD AND A. T. KINSEY. *Trans. Kansas Acad. Sci.*, 17, 38–41, 1899–1900.—From the results of five experiments made upon cats, rabbits, and fowls, during which the animals lived in an atmosphere of oxygen for from twenty hours to six days and twenty-one hours, the authors "feel justified in concluding that an atmosphere of oxygen produces no permanent excitation, and no unnatural sleep or unconsciousness, and is not destructive to animal life." The rabbit, which had previously undergone one experience of fifty-three hours, was again made to live in oxygen for twenty hours and then immediately killed. "No change could be detected in the organs. The blood seemed to clot more rapidly than normally and the arterial blood was of a brighter hue. The venous blood was also probably a very little changed in color."

W. F. HILLEBRAND.

PHARMACEUTICAL CHEMISTRY.

The So-Called Pure Berberine of R. Gaze. BY H. M. GORDIN AND C. G. MERRILL. *Arch. d. Pharm.*, 239, 626.—Gaze's method for making pure berberine consisted in boiling berberine acetone with a mixture of chloroform and alcohol under a reflux condenser for twelve hours. Gordin and Merrill find that the chloroform is decomposed by the berberine in the same way that chloroform is decomposed by fixed alkali. Consequently the so-called pure berberine of Gaze was found to be the hydrochloride.

A remarkable fact ascertained during this work was the change of basicity of berberine when the acid sulphate of this alkaloid is precipitated by a neutral precipitant like potassium iodide. One molecule of a monobasic acid was set free in this reaction for every molecule of berberine.

Digitized by Google

Two New Methods for the Quantitative Determination of Berberine. By H. M. GORDIN. *Arch. d. Pharm.*, 239, 638

I. The first method is based upon the equation $C_{20}H_{17}NO_4.H_2SO_4 + KI = C_{20}H_{17}NO_4.HI + KHSO_4$. By estimating the amount of acid set free with standard alkali the berberine can be determined. The drug is extracted with alcohol, the berberine precipitated, as a sulphate, then converted into the hydriodide as above, and the acid determined in an aliquot portion of the filtrate. A correction, which was accurately determined, must be allowed for the solubility of the sulphate in the ethereo-alcoholic medium.

II. The second method is based upon the formation of berberine acetone. The drug is exhausted with alcohol, the extract concentrated to a small volume, and then made up to a large definite volume with water. It is clarified with talcum, filtered, and in an aliquot part the berberine precipitated as the hydriodide. After washing, it is converted into the berberine acetone by the usual method, and weighed. A small correction for the amount lost by solution is added. Very close results are reported with both methods. J. O. SCHLOTTERBECK.

INDUSTRIAL CHEMISTRY.

Carbon Disulphide in the Electric Furnace. *Elec. World and Eng.*, December 21st.—The manufacture of carbon disulphide has been carried on for two years now at Penn Yan, N. Y., by Edward R. Taylor in an electric furnace, the output reaching 100,000 pounds per month, and the furnace, after two years of continuous operation, remaining in efficient working order. The furnace is provided with a large central cylindrical body holding the charge of charcoal and from the dome of which a pipe runs to the condenser for the carbon disulphide. At the bottom are several concentric hoppers for sulphur, which melts as it comes to the charcoal, with which latter it mixes between two carbon electrodes. Between the electrodes is hard conductive carbon to protect them and to conduct the current through the charge. A double means of regulation is afforded, the current being governed either by the amount of conductive carbon introduced or by reducing the working surface of the electrodes by partially submerging them in the molten sulphur, and the waste heat of the furnace walls and of the electrode connections is utilized for liquefying the sulphur. S. P. SADTLER.

An Electric Resistance Magnesia Crucible Furnace for Laboratory Use. *Eng. and Min. J.*, November 16, 1901.—See This Review, p. 85.

Carburetted Water Gas. *Scientific Amer. Suppl.*, December 14, 1901.—The entire history of the manufacture of water-gas

Digitized by Google

is recorded briefly, leading to the account of the practical apparatus of Du Motay. The article considers that this was the apparatus brought out in this country by Strong and Lowe. (A fuller history of the historical development of the Lowe water-gas system will be found in a report made to the Franklin Institute of Philadelphia in May, 1886, by a special committee of judges, who considered all the earlier water-gas patents and suggestions.) The present article gives an account of the latest forms of generators of Strache and Dellwick-Fleischer and a discussion of the results and analyses of the gases formed. S. P. SADTLER.

The Chemistry of Producer Gas. *Scientific Amer. Suppl.*, December 14, 1901.—The subject is treated quite fully but withal concisely. It attempts to give the conditions governing the largest possible output of carbon monoxide, namely, having the fuel at a temperature as near 1000° C. as possible, a slow current of air, and a porous or finely divided fuel. The author considers that an ideal producer should yield a gas containing 24.3 volumes of carbon monoxide, and 65.6 volumes of nitrogen. (The theory of producers will also be found well treated in the latest (15th) edition of Fischer's "Chemische Technologie," Vol. I, pp. 37–48.) S. P. SADTLER.

Oil Fuel for Locomotives. *Amer. Eng. and R. R. Journal*, December, 1901, p. 387. H. B. Gregg, engineer of tests of the Santa Fe Pacific Railroad, California, gives an interesting account of the practice on the Pacific coast so far as developed. The essential equipment for the burning of crude oil in locomotives consists of: A tank with necessary valves and piping for storing, regulating and conducting the oil, a burner that will properly atomize it, a jet of steam or air for the atomizer, a fire-box containing the proper brickwork and having an ash-pan with suitable openings to admit air for combustion.

These requirements are then described and illustrated. The writer states that in general the comparative cost of handling oil fuel is estimated at 75 per cent. less than coal and it possesses the advantages of freedom from cinders and black smoke, adapting it especially to passenger service. On the other hand, the additional cost of repairs to the brickwork, flues, and fire-boxes is estimated at 25 per cent. more in oil-burning engines than repairs in engines burning coal. The author promises in a future article to present the results of tests comparing oil with coal as fuel. S. P. SADTLER.

Does Anthracite Deteriorate upon Weathering? *Power*, December, 1901.—A writer in *Mines and Minerals* publishes analyses of coal washed from a bank of waste pea coal and of the same grade freshly mined, and shows by comparison of volatile combustible matter and fixed carbon that the exposed coal has

Digitized by Google

lost little, if any, of its heating value. It contains more moisture, as might be expected, and less ash, but this latter may be due to the removal of the broken slate during the washing.

S. P. SADTLER.

Mercury Arc Lamp. *Western Electrician*, December 14, 1901.—The mercury arc lamp described by Arons gives an intense monochromatic light and is, moreover, noiseless. It is, according to O. Lummer, of great value in polarimetric work and more especially in the study of the Zeeman effect. The lamp is cooled in running water while the arc portion is free and being therefore of a higher temperature, no condensation of mercury can take place here. This portion is enclosed in a cylindrical tube of ground glass, only the ends being clear, and through these the light is viewed. S. P. SADTLER.

New Forms of Vapor Lamps. *Electrical World and Eng.*, December 14, 1901.—These are the subjects of patents issued recently to Peter Cooper Hewitt, and consist of rather long vacuum tubes with a mercury lower electrode and an upper electrode in a widening of the tube. The bulb is connected by a small tube to condense excess of mercury vapor, and the upper electrode, by a wire on the outside, to a strip or band of tinfoil surrounding the mercury on the outside of the tube. Sulphide of mercury is used to start the action and a high voltage current at first is obtained by the use of a Wehnelt interrupter, which is then automatically cut out. S. P. SADTLER.

Manufacture of Metallic Sodium by the Electrolysis of Fused Sodium Nitrate. *Jour. Franklin Inst.*, January, 1902.—Presented, also, at the Philadelphia meeting of the American Chemical Society.—James D. Darling describes the manufacture of metallic sodium and nitric acid as carried out under his patents at the works of Harrison Bros. & Co., at Philadelphia, and in the same number is found the report upon the process as made by a subcommittee of the Science and Arts Committee of the Franklin Institute. The construction of the furnace is as follows: A cast-iron pot set in a brick furnace to contain the nitrate to be decomposed also acted as the anode or positive electrode. A 6-inch layer of refractory insulating material was placed in the bottom of the pot and the porous cup rested centrally upon it, leaving a 3-inch space between the cup and the pot. This space was then filled with sodium nitrate and the cup itself nearly filled with melted sodium hydroxide. The cathode or negative electrode consisting of a short length of 4-inch wrought iron pipe, provided with proper electrical connections, was suspended inside of the cup, reaching nearly to the bottom. Bridges made of wrought iron pipe support these cathodes in a row of porous cups. When external

Digitized by Google

heat is applied to the furnace, the electrolytes melt and, permeating the walls of the cup, allow the current to pass. The result of the passage of a current of electricity of a suitable strength through such an arrangement is decomposition of the sodium nitrate into sodium, nitrogen dioxide and oxygen. The nitrogen dioxide and oxygen are liberated as gases at the positive electrodes and escape through the hole in the cover provided for that purpose. The positive sodium ions pass through the walls of the cup and on through the molten sodium hydroxide to be ultimately liberated in the metallic state at the cathodes. The first sodium liberated is absorbed by or combined with the sodium hydroxide, hydrogen gas being evolved, and sodium monoxide probably being formed. After some time sodium rises to the top of the electrolyte in the cups and at intervals of about one hour is dipped off with a spoon and preserved under mineral oil.

This style of porous cup and furnace gives excellent results. The use of two electrolytes of different character, yet having a common base, allows of the sodium being liberated in a neutral medium away from all danger of oxidation by the nitrate from which it is obtained. At first the sheet metal walls of the porous cup had a very short life, being quickly eaten away by the local action caused by the secondary effects of the current. This trouble was overcome by shunting about 5 per cent. of the current directly through the metal walls of the cup, making them positive. This plan reduced the local action and increased the life of the cup about ten times. The material now used for the porous cup is a mixture of ground dead-burnt magnesite, and Portland cement, and it makes a very satisfactory diaphragm.

The nitrogen dioxide and oxygen evolved at the positive poles are conducted by means of earthenware pipes to a number of receivers or Woulff bottles connected together and containing water. The nitrogen dioxide coming in contact with the water combines to form nitric acid, $3NO_2 + H_2O = 2HNO_3 + NO$. The NO takes up a molecule of oxygen to again form NO_2, and more nitric acid is formed. If it is desired to make a very strong acid for use in the manufacture of high explosives, a system of towers that automatically bring the strength of the acid up to a high degree is used.

Each furnace takes a current of about 400 amperes at an average E. M. F. of 15 volts. External heat is used only when starting up and when changing the cups which have a life of 425 to 450 hours; at other times the heat generated by the resistance to the passage of the current is sufficient to keep the electrolytes melted.

The committee of judges, who reported on the process of Mr. Darling, say, among other things, that "the actual pots in operation worked without the explosions characteristic of other electrolytic sodium processes. The ladling out of the metal was

Digitized by Google

witnessed and showed that the workmen had become familiar with the manipulations required." Also that "the arrangements for collecting the gases and producing nitric acid worked apparently as well as could be desired. The principal drawback to the process is the large amount of electrical power absorbed in the resistance of the porous partition, an inevitable concomitant of its use, but a disadvantage more than offset by the other features of the process, provided the process is run where power can be obtained cheaply." S. P. SADTLER.

A Substitute for Rubber. *Sci. Am.*, **85**, 349.—This substance is obtained by crushing the young shoots of the Rocky Mountain grease-wood plant, and extracting the milky sap by means of some such solvent as carbon disulphide. The solution is subjected to distillation, and the gummy residue is washed with hot water and rolled repeatedly. The resulting substance is very similar to India rubber. C. J. MOORE.

Corrosion of Steel Rails by Sea-Water in Tropical Countries. By J. W. POST. *Eng. News*, **46**, 394.—A cross-section of a rail when it was new is compared with a similar section after the rail had been exposed ten years to the action of sea-water in Sumatra. The dimensions of the flanges had decreased to such an extent that the fastenings ceased to hold the rail. It is recommended that in such cases rails with very thick flanges be used, or else they should be painted with a protective substance.
C. J. MOORE.

A High Chimney for Discharging Acid Vapors. *Eng. News*, **46**, 398.—This article is descriptive of the chimney erected at the works of the Orford Copper Co., Bayonne, N. J. This chimney is 365 feet in height, and the base is 30 feet square. The shaft is circular in form, and tapers from 28 feet 3 inches to 11 feet 9¼ inches. The special form and kind of brick used in the main shell is described. Inside of the main wall, and separated from it by an air space, is a lining composed of a substance that resists the action of the acid gases. C. J. MOORE.

Burning Bituminous Coal. By W. H. BOOTH. *Mines and Minerals*, November, 1901.—A discussion of how to avoid smoke and obtain perfect combustion. The principal point made is that when an excess of air is used, over 15 pounds per pound of fuel, the temperature at the upper surface of the coal is kept below the ignition temperature of the volatile hydrocarbons, and thus less perfect combustion results. This conclusion appears open to criticism. J. W. RICHARDS.

The Corrosion of Iron and Steel. *The Engineer*, **38**, 410.—The action of atmospheric agents on iron and steel, and the means of checking such action is the subject of this article. It

Digitized by Google

is explained that oxygen, carbon dioxide, and moisture act on iron only in conjunction, and that if any one be eliminated the action ceases. Precautions which should be observed in painting iron, and the means of protecting boilers from rust while not in use, are mentioned. C. J. MOORE.

Lignite and Peat Briquettes in Germany. BY F. H. MASON. *U. S. Consular Rep.*, 67, 342–343.—Brown coal (peat?) of Germany, as it comes from the mines, contains from 60 to 65 per cent. of water. This is reduced to about 12 per cent. by heating, the temperature being raised just high enough to render the mass plastic. It is then pressed into blocks, and sold to the poorer classes for domestic purposes. There are in Germany about 4,942,000 acres of peat bogs. Hitherto, peat has been little used for fuel in Germany on account of the difficulties attending the separation of it from impurities and water. Stauber has invented machines for pulverizing the material and eliminating impurities. Water is removed by pressure. The briquettes made from this substance analyze about 45 per cent. fixed carbon, 9.09 per cent. ash, 4.54 per cent. hydrogen, 29.34 per cent. oxygen. The thermal value is about 3,806. In addition to domestic heating, this material may be used for making steam. No details relating to the machines used in the process are given.
C. J. MOORE.

Gas Engines—Fuel Mixtures. BY E. W. ROBERTS. *The Engineer*, 38, 408–409.—The author explains the changes which explosive mixtures of gases undergo when they are ignited in the cylinder of a gas engine. Something as to the period of inflammation, under differing conditions, is stated. The initial and terminal pressures of the gases and the relation of the difference between these pressures to economy are discussed.
C. J. MOORE.

Electrical Pigment Furnace. *Elec. World and Eng.*, 38, 818.—This furnace is designed for the production of the dioxide of tin. The metal is volatilized in the usual manner by a current of electricity, and the vapor is allowed to escape through a contracted orifice into the combustion chamber through which a current of air is driven. The fumes are collected in bags. The purity of the product appears to be the sole advantage of the process. C. J. MOORE.

Electrical Incomes and Outputs Per Ton of Coal. BY ALTON D. ADAMS. *Elec. World and Eng.*, 38, 814–815.—The figures representing the incomes and the coal consumed by 26 electrical plants in Massachusetts, are the basis of the calculations presented in this paper. There is a striking variation in the incomes of different plants per ton of coal consumed, and this the author attributes to inefficient operation rather than to a poor

Digitized by Google

market. The illustrations given lead to the conclusion that some plants are several-fold more efficient than others, and that small stations are often just as efficient as large ones. It is well known that the total number of kilowatt hours delivered by any system is a profound secret. The author explains, however, that this can be calculated from the data relating to street lighting and the fact that the total income is known, given in the report of the Gas and Electric Light Commissioners. Then knowing the total number of kilowatt hours for all service and also the coal consumed, it is an easy matter to construct a table showing the number of pounds of coal required by different plants to generate a kilowatt hour of energy and, therefore, to compare the efficiency.

C. J. MOORE.

The Nernst Lamp. *Western Electrician*, **29**, 302–303.—This article is a description of several different forms of electric lamps, in all of which the incandescing material consists of highly refractory oxides. These oxides have such a high specific resistance that stout rods can be used. A vacuum is not necessary. Before rods made of such materials will conduct a current, they must be heated, and this is done by placing a heating resistance near the glower and so arranged that the circuit through it is cut out as soon as the glower rods are heated to a conducting temperature.

C. J. MOORE.

Water Purification. *Am. Eng. and R. R. J.*, **75**, 344–345.—The automatic machine used at Buda, Ill., to reduce the amount of incrusting solids in hard water is described and illustrated. Lime-water and soda are added to the hard water as it enters the top of a tall settling cone. The precipitated solids pass to the bottom with the water, but remain there while the water rises through a number of baffle plates, placed between the cone and an outside cylinder, and, finally, it passes through wood-fiber filters. It is stated that in the whole process the solids are reduced from 20.76 to 3.61 grains per gallon.

C. J. MOORE.

What Water-Softening Will Do. *Am. Eng. and R. R. J.*, **75**, 317.—This article favors preliminary chemical treatment of bad water which is to be used in locomotives. Examples are given to illustrate how much more efficient an engine is when a fine quality of water is used. In several instances locomotives in which treated water was used ran 12,000 miles per month, and it was necessary to wash out the boilers only twice in this time.

C. J. MOORE.

The Rotary Kiln Process of Cement Manufacture. By W. H. STANGER AND BERTRAM BLOUNT. *Eng. News*, **46**, 315–320.—The argument presented in this paper, as is stated by the editor of the *News*, favors a general adoption of the rotary kiln process

Digitized by Google

for the manufacture of Portland cement. It shows, first, that the process is economical and, secondly, that it may be used with various kinds of raw material. Several forms of fixed kilns are described in order that a comparison may be drawn between them and the rotary kiln. The evolution of the rotary kiln is traced from its beginning in the Ransome kiln, patented in 1885, to the Hurry and Seaman kiln, used by the Atlas Co., and in which a high state of development is reached. A difficult problem presented to the inventors was to discover some material suitable for lining the clinkering zone of the cylinder. Messrs. Hurry and Seaman found an ideal substance in clinker itself backed by firebrick. A high and uniform temperature is obtained by burning powdered coal from an air-injector burner. In addition to describing the Atlas kilns in detail, the authors give an interesting account of the way in which wet raw material is burnt in rotary kilns in Bronson, Mich. The article contains calculations concerning the amounts of heat theoretically and practically required to burn cement. Figures relating to the cost of production of cement per ton are given. In an editorial the value of the rotary kiln for burning either wet or dry raw material is discussed, and then the rotary process as a whole is compared with that in which the continuous kiln is used. C. J. MOORE.

Asphalt Pavements in the Borough of Manhattan, New York. BY E. P. NORTH. *Eng. Rec.*, 44, 418–419.—This article is based on statements made in the reports of the Department of Highways of New York City. The cost of asphalt pavement laid during the administration of Mayor Gilroy, term ending with the year 1894, is compared with that laid during Mayor Strong's term which ended in 1897. The matter of five-year and fifteen-year maintenance contracts is discussed, and the author concludes that it is greatly to the advantage of the city to require long contracts. C. J. MOORE.

Silica Cement Mortars. BY W. TWEEDDALE. *Trans. Kansas Acad. Sci.*, 17, 43–44, 1899–1900.—Attention is called to a Kansas product called, in Vol. V, *University Geol. Surv., Kansas*, "volcanic ash." It is almost inexhaustible in amount and consists of nearly white silica in thin transparent microscopic scales. After a presentation of the characteristics of, and differences between, lime and cement mortars and between cement mortars of different kinds it is suggested that this silica cement will be of greater value in the manufacture of mortars than sand cement.
W. F. HILLEBRAND.

AGRICULTURAL CHEMISTRY.

Alkali and Alkali Soils. BY W. H. HEILEMAN. *Wash. Agr. Expt. Sta. Bull.*, No. 49, 1–35.—Chemical analyses of the

Digitized by Google

water-soluble material in the soils of Kittitas and Yakima valleys, Washington, are reported in detail and the results are discussed, together with general remarks on the nature and detection of alkali salts and the reclamation of alkali lands.

H. W. LAWSON.

Tolerance of Alkali by Various Cultures. BY R. H. LOUGHRIDGE. *Cal. Agr. Expt. Sta. Bull.*, No. 133, 1–43.—This bulletin gives the results of extended investigations to determine the highest amounts of the different alkali salts tolerated by fruit trees, grapes, vegetables, cereals, forage crops, and other plants. Determinations were made of the alkali salts, chiefly sodium carbonate, sulphate, and chloride in each foot of soils bearing the various crops to a depth of 4 feet. The analyses of such soils as were considered typical of the effect and non-effect of alkali are reported in detail and summarized. The injurious nature of sodium chloride is pointed out. Sodium sulphate was generally not injurious when present in quantities less than 10,000 pounds per acre to a depth of 4 feet. Of the different fruits, grapes and olives were able to withstand the largest quantities of the different alkali salts, the total quantity of alkali tolerated being over 40,000 pounds per acre to a depth of 4 feet. Lemons were especially sensitive to the effects of alkali. Salt-bushes were not injured by the presence of 156,000 pounds per acre in 4 feet of soil. The amount of alkali tolerated by plants was found to vary with the vertical distribution of the alkali in the soil, the character of the soil, and, in some instances, with the variety and age of the plant.

H. W. LAWSON.

The Value of Meadow Muck. BY F. W. MORSE. *N. H. Expt. Sta. Bull.*, No. 83, 53–56.—A discussion of the comparative value of barnyard manure and muck based on data taken from the work of the experiment stations. One cord of manure, as regards fertilizing constituents, is calculated to be equivalent to 3½ cords of muck. The variable character of muck is pointed out.

H. W. LAWSON.

Official Method for Analysis of Tanning Materials. *U. S. Dept. Agr., Bureau of Chem. Circ.*, No. 8, 1–2.—This method as adopted at the last convention of the Association of Official Agricultural Chemists differs from that previously adopted mainly in the use of chromed hide powder in the determination of non-tannins. In the present method 20 grams of hide powder are prepared by digesting twenty-four hours with 500 cc. of water and adding 0.6 gram chrome alum in solution, one-half at the beginning and one-half at least six hours before the end of digestion. This is washed by squeezing through linen and pressed, and approximately one-fourth is taken for moisture determination, and the remaining three-fourths is shaken for ten minutes with

Digitized by Google

200 cc. of the solution for analysis, which is so prepared that 100 cc. contain about 0.35–0.45 gram tannins. One hundred cubic centimeters of the clear filtrate are evaporated. The tannins are shown by the difference between the soluble solids and the nŏn-tannins. H. W. LAWSON.

Effect upon the Composition of the Soil of Continuous Cropping by Wheat. By J. T. WILLARD. *Trans. Kansas Acad. Sci.*, 17, 41–42, 1899–1900. W. F. HILLEBRAND.

A Soil Study, Part III. The Soil. By WM. P. HEADDEN. *Bull. of the Agr. Expt. Sta. of the Agr. Coll. of Colorado*, No. 65, September, 1901. 56 pp.—Certain parts of this research are of interest to the geologist as bearing upon the ready solubility of some minerals under cultural conditions. Orthoclase, an almost universal constituent of the soils of the eastern slope of the Rocky mountains, in Colorado, serves as a source of potash and also of hydrous silicates, and it is shown experimentally that the oat plant may be grown and may thrive on artificial soil in which the only source of potash is powdered feldspar. It was found that the anomalously constituted ash from 238.5 grams of oat plants held 1.4417 grams of potash beyond that originally in the planted seed. Numerous detailed bulk analyses of soils and of aqueous and acid extracts, etc., accompany the report, as also of the alkali incrustations so common in Colorado, and which are said to be essentially mixtures of sodium, magnesium, and calcium sulphates. It is further found that the water soluble in the soil and the incrustations naturally differ greatly in composition. W. F. HILLEBRAND.

Report of the Secretary of Agriculture. *Science*, 14, 954–965. —The fifth annual report of Hon. James Wilson, Secretary of Agriculture, is somewhat extended over those of former years to cover the rapidly increasing growth of that department of the government. The work of the various bureaus is treated in detail.

The Weather Bureau has now extended its scope to the extent of receiving reports from foreign points. Attention is called to the enormous amount of inspection in the line of animal husbandry and its importance in furthering our export trade in meat products. Attention is called to the increasing amount and growing value of the work of the several scientific bureaus of the department in studying animal and plant diseases, adulterations, insect depredations, etc.

The work of the experiment stations recently established in Alaska, Hawaii, and Porto Rico is reviewed and a recommendation made that this work be taken up in the Philippines.

Considerable space is devoted to irrigation investigations in the arid regions of the west and to the maintenance of the forest reserves.

Digitized by Google

In conclusion attention is called to the difficulty of retaining well-equipped men in the department because of the meager salaries sometimes paid, and Congress is urged to allow more liberality in this regard. D. W. MAY.

PATENTS.

MAY 7, 1901.

673,377. John B. Bernadou, U. S. Navy. Colloid explosive. An ether colloid of ether alcohol insoluble nitrocellulose, possessing a content of nitrogen above that corresponding to the formula $C_{12}H_{15}O_5(NO_3)_5$, made by subjecting insoluble nitrocellulose and ether in a closed vessel to a temperature below that of freezing ethyl alcohol of 95 per cent. by volume, mechanically agitating the cooled mixture, graining and drying.

673,388. Robert Demuth, Elberfeld, Germany. Assignor to the Farbenfabriken of Elberfeld Co., New York, N. Y. Blue cotton dye. From 1,8-aminonaphthol-2,4-disulpho acid by the action of alkaline sulphide and zinc-carrying compounds at high temperature, forming a blackish powdery mass, almost entirely soluble in water, with a blue color, the same in hot dilute, caustic soda and ammonia, in concentrated sulphuric acid blue-red, precipitated from water solutions by mineral acids, hydrogen sulphide being set free, and fast to alkalies.

673,400. Ernst Kretschmann, Gross Lafferde, Germany. Paper for sympathetic ink. Paper contains a non-hygroscopic salt of cobalt, and requires an ink of sodium chloride and a hygroscopic salt as calcium chloride.

673,537. Charles Haslwanter, Jr., Brooklyn, N. Y. Assignor to Harwood Huntingdon, New York, N. Y. A headless safety match impregnated with chlorates and potassium antimoniate.

673,570. Erwin F. von Wilmowsky, Boston, Mass. Refining gutta percha by digesting it with liquid petroleum products, separating the insoluble portions, cooling the solution till the gum precipitates, washing the gum in petroleum naphtha, and drying it.

673,632. Fritz Bender and Bertram Mayer, Muhlheim-on-Main, Germany. Assignors to Farbwerke Muhlheim, vorm. A. Leonhardt & Co., same place. Green-blue dye, a dark copper-like powder, soluble in water with blue color decolored by cold caustic soda, but restored by acetic acid; in sulphuric acid gives yellow solution, turning green, then blue on dilution with water. Made by condensing tetramethyldiaminobenzhydrol with paratoluenesulphonic acid, sulphonating the monosulphonic acid to a disulphonic acid and oxidizing the latter.

673,640. Arnold Hess, Hochst-on-Main, Germany. Assignor to Farbwerke vorm. Meister, Lucius and Bruning, same place.

Digitized by Google

Blue wool dye. A solution of 1,5-dinitronaphthalene in chlorosulphonic acid is acted on by hydrogen sulphide at 140° C., yielding a black-blue powder of metallic luster, that gives a blue-violet solution in hot water and sodium carbonate, blue in soda lye and brown in concentrated sulphuric acid, insoluble in nitrobenzene and giving gray shades by treatment with chromates after dyeing.

673,654. Edwin D. Douglas, Ogontz, Pa. Fuel adapted to produce flames of different colors by treatment with salt, copper acetate, and a salt of an alkaline earth.

673,691. Oscar Bally, Mannheim, Germany. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Anthraquinone dye, blue to green. Combines a halogen diamino anthraquinone with an aromatic amine. The dye is soluble in aniline and nitrobenzene blue to green, concentrated sulphuric acid, turning it brown, and heating to 100° C., changing it to violet, while in its sulphonated form it is soluble in water.

673,761. Alfred H. Cowles, Cleveland, Ohio. Assignor to the Electric Smelting and Aluminum Co., of Illinois. Process of reducing sodium compounds by mixing sodium aluminate with granular carbon, heating said mixture in an electric furnace, whereby sodium is reduced and volatilized, then condensed, and the aluminum carbide is tapped off.

MAY 14, 1901.

673,887. Julius Oppermann and August Fette, Biebrich, Germany. Assignors to Kalle & Co., same place. Process of making nitro- and chlorbenzaldehyde by boiling chlorinated orthonitrotoluene free from acid with dilute alcohol, sodium acetate and sodium carbonate, distilling off the alcohol separating from the salt solution and oxidizing the remaining oil by a mixture of sulphuric and nitric acids, obtaining thereby a mixture of *o*-nitrotoluene and *o*-nitro- and *o*-chlorbenzaldehyde, separating the aldehydes by alkali bisulphite and adding a caustic alkali and pressing the mass or separating by steam.

673,962. Carl Moldenhauer, Frankfort-on-Main, Germany. Assignor to Gold und Silber Anstalt, vorm. Roessler, same place. Process of making alkali cyanide by melting in a crucible an alkaline carbonate with a flux and adding alkaline ferrocyanide.

673,974. Louis M. Bullier, Paris, France. Process of reducing metallic sulphides by calcium carbide, separating copper from iron, by differences of specific gravity, the sulphides being in a molten state.

674,031. Ambrose G. Fell, New York, N. Y. Process of making lead oxide by forming a lead salt decomposable by an alkali, then treating the mass with alkali to make an oxide, dis-

Digitized by Google

solving out the soluble salts of the alkali, and heating the residue with a solution of alkali to dissolve the lead oxide, and cooling to crystallization.

674,137. Gustav Link, Hochst-on-Main, Germany. Assignor to Farbwerke, vorm. Meister, Lucius and Bruning, same place. Brown dye from an aqueous solution of 1,8-dinitronaphthalene and sodium sulphide evaporated to dryness and heated to a high temperature for some time. A black-brown mass readily soluble in water from which the dye is precipitated by acids.

674,140. William D. Patten, Brooklyn, N. Y. Baking-powder, consisting of a carbonate of an alkali, and an acid pyrophosphate of soda having the formula about $H_2Na_2P_2O_7$ which is non-hygroscopic, and obtained by heating acid orthophosphate of soda to above 350° F., but below redness.

674,159. Jonas E. Blomen and Henry E. Aspinwall, Pompton township, N. J. Explosive, consisting of a colloided comminuted friable mass of co-nitrated cellulose, a hydrocarbon and a hydroxyl derivative of a hydrocarbon.

674,291. Jonas E. Blomen and Henry C. Aspinwall, Pompton township, N. J. Explosive of co-nitrated cellulose and a hydrocarbon.

674,292. Same parties, and method of making above.

674,295. Thomas Ewan, Birmingham, England, and Johannes Pfleger, Frankfort-on-Main, Germany. Process of making alkaline amides, by passing a rapid current of ammonia gas into the interior of molten alkali metal.

674,361. Herbert A. Richardson, Lowell, Mass. Process of preparing potable gold by heating a solution of honey, and introducing, while boiling, a weak solution of gold chloride.

MAY 21, 1901.

674,412. Ludwig O. Helmers, Hamburg, Germany. Assignor to Ichthyol Gesellschaft, Cordes, Hermanni & Co., same place. Sulphonized mineral oils containing formaldehyde, made by reacting on sulphuretted hydrocarbons with sulphonic acid and treating the product with formaldehyde in acidulated solution. A greenish brown oil containing sulphur, odorless and insoluble in water.

674,593. Friedrich L. Bartelt, Brislington, England. Washing compound of an alkaline carbonate and silicate with a solution of zinc in excess of alkali.

674,686. Baptist Reuter, Hochst-on-Main, Germany. Assignor to the Farbwerke, vorm. Meister, Lucius and Bruning, same place. Acid camphorate of phenyldimethyl pyrazolon. White crystals, melting at 95°–98°, readily soluble in hot water, alcohol and dilute acids, difficultly soluble in ether, benzene, and

Digitized by Google

ligroin, and formed by the reaction of camphoric acid on phenyldimethyl pyrazolon in molecular proportions.

674,687. Baptist Reuter, Hochst-on-Main, Germany. Assignor to the Farbwerke, vorm. Meister, Lucius and Bruning, same place. Neutral camphorate of phenyldimethyl pyrazolon. White crystals, melting at 96°–100°, otherwise similar to 674,686, but formed by the action of two molecules of phenyldimethyl pyrazolon on one of camphoric acid.

674,759. Charles F. Cross, London, England, and George A. Parkes, Muckmore, Ireland. Bleaching fabrics by saturating them at full width with a mixture of soap, silicate, caustic soda, oil and water, and then exposing them to the action of steam.

674,764. Richard Hartler, Aachen, Germany. Assignor to Chemische Fabrik Rhenania, same place. Nutrient medium for cultures of microorganisms, consisting of a mixture of legumin, acid potassium phosphate, and grape sugar.

674,780. Jules H. Lavollay and Gustave E. Bourgoin, Paris, France. Electrolytic process of purifying crude spirit. Mixes calcium manganate in powdered form with the spirit to be purified, and sends an electric current through it.

674,809. Sherard O. Cowper-Coles, London, England. Assignor to the Cowper-Coles Metal Extraction Syndicate, Limited, Melanear Haeyle, England. Complex zinc ore is crushed, screened and roasted, leached with weak sulphuric acid to extract zinc and copper, the solution is run through a body of carbon and an electropositive metal to get copper, and the remaining solution is electrolyzed to recover the zinc.

675,018. Emil Rueff, New York, N. Y. Process of making alkaline magnesite, which consists in mixing 1 part calcined magnesite with 20 parts water and forcing carbon dioxide through it while agitating, and at a pressure of about 25 pounds till the mixture has absorbed less than 1 part by weight of carbon dioxide, heating the mass to 160° F., draining, drying, and compressing.

MAY 28, 1901.

675,190. Henry S. Blackmore, Mt. Vernon, N. Y. Process of reducing metals and producing alloys therefrom. Exposes a molten bath of inert chemical salts free from hydrogen containing metallic oxide at a temperature below its normal melting-point to the action of metallic carbide, for instance, aluminum oxide and aluminum carbide.

675,216. Carl Hofmann, Hochst-on-Main, Germany. Assignor to Farbwerke, vorm. Meister, Lucius and Bruning, same place. Rhodamine sulphonic acid. Sulphonates asymmetric dialkyl rhodamines, derived from diethylaminodioxybenzoylbenzoic acid, and

Digitized by Google

o-aminoparacresol, obtaining red wool dyes, soluble in alcohol and acetone with blue-red color and yellow-green fluorescence, hardly soluble in water, easily soluble in alkali.

675,217. Benno Homolka, Frankfort-on-Main, and Friedrich Hubner, Hochst-on-Main, Germany. Assignors to Farbwerke, vorm. Meister, Lucius and Bruning, same place. Process of making phenylglycine orthocarboxylic acid. Heats to a high temperature a mixture of orthohalogen benzoic acid and glycocoll, both in the form of their salts, and isolates the product.

675,329. Thomas J. Hesket and Henry Jones, Adelaide, South Australia. Assignors to said Hesket. Process of making steel, which consists in heating a mixture of an iron-bearing charge, a carbonaceous material and a flux, supplying air, thus making a bath of highly carburized molten iron which is treated by the Bessemer process, causing a stream of highly carburized iron to flow continuously into said bath and out of contact with the atmosphere, and maintaining an upflow of the combustible gases and burning them in the zone of combustion.

JUNE 4, 1901.

675,407. Georges Peltzer, Verviers, Belgium. Apparatus for extracting fat from wool. A closed chamber and a feeding device and a tank for carbon tetrachloride at one end, a traveling apron inclining upward from the tank, pressure rollers above said apron, and nozzles, whereby the carbon tetrachloride can be showered on the wool, and a washing tank into which the wool is discharged.

675,434. Emil Zacharias and Eugene Bernhard, Griesheim-on-Main, Germany. Assignors to Chemische Fabrik, Griesheim Electron, Frankfort, Germany. The process of producing derivatives of nitronaphthalene which consists in heating 1,4-chlornitronaphthalene with alcohol in aqueous solution of an alkaline hydroxide whereby the chlorine is replaced by a hydroxy, alkoxy, amino or alkylamino radical.

675,455. John B. Tibbits, Hoosic, N. Y. By Le Grand C. Tibbits, Administrator. Process of manufacturing lead salts (colored pigments). Dissolves electrolytically, in an alkaline solution, an electrode of lead and copper, and passes carbon dioxide through the bath.

675,472. Edward H. Ford, Chicago, Ill. Assignor to William Kent, same place. Smokeless powder, containing ammonium picrate and barium nitrate in equal parts, with 15 per cent. of picric acid additional.

675,538. Otto Bonhoeffer, Elberfeld, Germany. Assignor to the Farbenfabriken of Elberfeld Co., New York, N. Y. Diethylcarbinolurethane obtained by the reaction of urea nitrate on diethyl carbinol, isolating and purifying the product which is in

Digitized by Google

small white needles melting at 112° C., soluble in alcohol, ether, benzene, hot ligroin and water, and adapted for use as a soporific.

675,539 and 675,540 are by and to the same parties as the above, and relate to methylisopropylcarbinolurethane and methylethylcarbinolurethane, also similar in characters and use.

675,543. Arthur Eichengrün, Elberfeld, Germany. Assignor to Farbenfabriken of Elberfeld Co., New York, N. Y. Derivatives of aromatic oxyaldehyde substituted by the group CH_2X, X meaning a halogen atom, by heating aromatic oxyaldehydes with a solution of halogen methylic alcohol in concentrated hydrochloric acid, and filtering off the product. This from salicylic aldehyde is a white powder, crystalline, melting at 88° C., easily soluble in ether, acetic acid, acetone and chloroform, not soluble in petroleum, ether or ligroin.

675,544. Arthur Eichengrün, Elberfeld, Germany. Assignor to Farbenfabriken of Elberfeld Co., New York, N. Y. Derivatives of aromatic hydroxy acids, which contain the group CH_2X, X meaning a halogen atom, which are insoluble in cold water and soluble in most organic solvents, and are crystalline powders formed by heating a mixture of hydroxy acid as salicylic acid with a halogen methylic alcohol in concentrated hydrochloric acid, filtering off and purifying.

675,555. Edwin D. Chaplin, Winchester, and Henry G. Halloran, Boston, Mass. Electrolytic production of white lead. A solution of a soluble salt of a lead anode is formed electrolytically in the presence of a soluble chloride salt, to transform the lead salt into lead chloride, this is oxidized, and the oxychloride carbonated to form a hydrated carbonate of lead by means of an alkaline carbonate.

675,568. Oscar Nastvogel, Elberfeld, Germany. Assignor to the Farbenfabriken of Elberfeld Co., New York, N. Y. Yellow acridin dye soluble in water and alcohol with yellow-green fluorescence, solution in concentrated hydrochloric acid yellow-brown, and also in concentrated sulphuric acid, changing to orange-red with a little ice and to orange-yellow on adding more, and made by heating dilute mineral acids with unsymmetrical alkyl derivatives of tetraamidodialphylmethane, oxidizing the resulting leucocompound, and isolating the dye. Dyes leather yellow.

665,572. Robert E. Schmidt, Elberfeld, Germany. Assignor to the Farbenfabriken of Elberfeld Co., New York, N. Y. Blue anthraquinone dye, which dissolves more readily in hot than cold water, soluble in ammonia and acetic acid of 50 per cent., the solution in concentrated sulphuric acid changing from violet to red by a little ice, and by adding more, a dark sulphonic acid precipitate is formed. Obtained by sulphonating α-amino-α-alphylaminoanthraquinone, and isolating the dye.

Digitized by Google

675,573. Robert E. Schmidt and Andreas Jakobi, of Elberfeld, Germany. Assignors to Farbenfabriken of Elberfeld Co., New York, N. Y. Green anthraquinone dye, which dissolves green in water and ammonia, green-blue in hot alcohol and concentrated sulphuric acid, the latter unchanged by a little ice, but more precipitates a green sulphonic acid. Obtained by sulphonating 1,4,5,8-tetraalphylaminoanthraquinone and isolating the dye.

675,574. Robert E. Schmidt and Paul Test, Elberfeld, Germany. Assignors to Farbenfabriken, of Elberfeld Co., New York, N. Y. Blue anthraquinone dye derived from heating halogenized α-paratolylaminoanthraquinone sulphonic acid with paratoluidine, or other primary aromatic amine. Difficultly soluble in cold water, more easily in hot with a blue color, also in ammonia, dyeing unmordanted wool clear green-blue.

675,575. Robert E. Schmidt and Paul Tust, Elberfeld, Germany. Assignors to the Farbenfabriken of Elberfeld Co., New York, N. Y. Blue anthraquinone dye, obtained by heating 1,4-aminooxyanthraquinone with primary aromatic amines and isolating the dye. Difficultly soluble in cold, more easily in hot water, also in 90 per cent. ethyl alcohol and 50 per cent. acetic acid, soluble in concentrated sulphuric acid, violet, changing to red by a little ice while more precipitates a dark sulphonic acid.

675,584. Anson G. Betts, Lansingburg, N. Y. Plating aluminum by applying to its surface a fused non-oxygen haloid salt of a coating metal capable of dissolving aluminum oxide and of being reduced to the metallic state by aluminum. Cuprous chloride is used.

675,585. Melchior Boniger, Basle, Switzerland. Assignor to the firm of Chemical Works, vorm. Sandoz, same place. Black sulphur dye from paraoxyphenyl 1,4-nitronaphthylamine substances, alkali sulphide and sulphur.

675,627. Adolf Israel and Richard Kothe, Elberfeld, Germany. Assignors to Farbenfabriken of Elberfeld Co., New York, N. Y. Urea derivative of aminonaphthol sulphonic acids, a gray powder, adapted to combine with one or two molecules of diazo compounds, easily soluble in water, with difficulty in alcohol, the sulphonic acid being regenerated on boiling with 20 times its volume of hydrochloric acid. Derived from an aqueous solution of equal molecules of β-amino-α-naphthol-β-4-sulphonic acid and β-amino-α-4-naphthol-β-3-sulphonic acid with sodium carbonate treated with gaseous phosgene, $CoCl_2$.

675,628, 675,630, and 675,631 are to the same parties for similar processes and products, the latter number using carbon bisulphide, sulphur and alcohol in place of phosgene.

675,629, and 675,632 are to the same parties for azo dyes

Digitized by Google

obtained by combining the above urea derivatives with azo compounds and dyeing unmordanted cotton fast reddish shades, and containing the groups — N = NR and — N = N — R, respectively, being the radicals of diazo compounds.

675,686. Gebhard N. Vis, Schweitzerhalle, near Basle, Switzerland. Purifying brine by adding an excess of sulphates more soluble than gypsum and an excess of calcium hydroxide, agitating the mixture, separating the precipitate and neutralizing with carbon dioxide.

675,760. Carl Uebel, Aachen, Germany. Assignor to Chemische Fabrik Rhenania, same place. Apparatus for making nitric acid consisting of a furnace including a main flue having a plurality of separate branches, a retort in said flue and a plurality of retorts mounted in the respective branches and communicating with the main retort.

675,822. Chester B. Duryea, New York, N. Y. Method of making a thin boiling starch by adding acid to a mixture of starch and water in a free flowing state of suspension, and maintained at as high a temperature as practicable without breaking down the starch granules, then removing the acid.

675,826. Joseph F. Geisler, New York, N. Y. Assignor to the American Wood Fire-Proofing Co., same place. Fire-proofing and preserving wood by applying an ammonium salt, a zinc ammonium salt, a saponifiable oil, and ammonia, successively.

JUNE 11, 1901.

675,901. Alwyn Nieske, Dresden, Germany. The process of fire-proofing and preserving fabrics, weich consists in subjecting such material to a solution of molybdate of sodium.

675,938. Elie Delafond, New Orleans, La. Process of facilitating the crystallization of sugar. Subjects a syrupy sugar juice to the action of carbon dioxide while agitating under pressure.

676,095. Nelson B. Mayer, Newark, N. J. Assignor to the American Rubber Filling Co., New York, N. Y. A composition for forming the cores of elastic cushions consisting of glue 30, glycerol 50, dextrine 10 parts by weight, the glue and dextrine being dissolved in the glycerol.

676,111. Jonas W. Aylsworth, East Orange, N. J. Phonographic record blank, of stearates and palmitates of soda and of lead, lead oleate, an acid resin, and a hydrocarbon.

676,134. Wilhelm A. C. Hunkemoller, Amsterdam, Netherlands. Artificial whalebone, made by acting on bones with hydrochloric acid to remove calcareous matter, treating the residue with chrome alum, and drying the product, then finishing it in strips like natural whalebone.

Digitized by Google

JUNE 18, 1901.

676,493. Charles S. Friedman, Philadelphia, Pa. Assignor to Edgar A. Bancroft, Trustee, Chicago, Ill. Water-proofing by subjecting the material to successive baths of glue solution and basic chromium chloride, respectively, whereby chromium sesquioxide is deposited in the interstices of the material.

676,494. Hugo Geldermann, Berlin, Germany. Assignor to Aktien-Gesellschaft für Anilin Fabrikation, same place. Black disazo dye containing as first component 6-3-diamino-*p*-cresolmethyl ether, as middle component *α*-1-naphthylamine-*β*-3-sulphonic acid, and as end component *β*-1-amino-*α*-4-naphthol-*β*-3-sulphonic acid, a dark powder of weak metallic luster, hardly soluble in alcohol, easily soluble in water to a dull-brown violet solution, this aqueous solution remaining unchanged by the addition of sodium carbonate or a little caustic soda, but an excess of the latter precipitating blackish violet flakes, soluble in concentrated sulphuric acid to a dull blue solution that on dilution with ice water becomes red and separates the dye. From a bath with soap or common salt the dye gives blue-black on unmordanted cotton that by diazotation and development with metatoluylenediamine gives a fine black.

676,495. Hugo Geldermann, Berlin, Germany. Assignor to Aktien-Gesellschaft für Anilin Fabrikation, same place. Blue disazo dye, containing as first component the 6-3-diamino-*p*-cresol methyl ether, as middle component *α*-1-naphthylamine-*β*-3-sulphonic acid, and as end component *β*-1-naphthol-*β*-3-sulphonic acid. This dye is a dark powder of metallic luster almost insoluble in alcohol, soluble in water violet-red, the solution unchanged by sodium carbonate or acetic acid, becoming blue-violet by a little caustic soda or more reddish by hydrochloric acid, which in excess precipitates blue to red-violet flakes, dyeing with soap or common salt gray-violet that by diazotation and development with *β*-naphthol give a fine indigo-blue.

676,507. Cenek Lorenz, Konigi Weiberge, Austria-Hungary. Fire and dry rot proof air-tight masonry. Wets the building material with water-glass, lays up the masonry with a mortar as strong as the material, and allows it to harden, and applies the soluble glass to the whole construction.

676,514. Walter Rathenau, Berlin, Germany. Making calcium carbide simultaneously with silicide of iron. Fuses raw material containing carbon, calcium and silicon, adds a substance containing a metal, as iron, that has more affinity for silicon than calcium has, and separating the calcium carbide and the silicon compound from the fused mass.

676,548. Julis A. Reich, Vienna, Austria-Hungary. Fluorine compound made by heating dry silico-fluorides with an alkaline metallic oxide, such as caustic lime.

Digitized by Google

676,550. Gustavus A. Will, St. Louis, Mo. Composition for lining paint casks, consisting of water, 40 ; glue, 8 ; glucose, 50 ; turpentine, 2 ; calcium carbonate, 60; and zinc oxide, 15 parts by weight.

675,555. Arthur Hausdorfer, Elberfeld, Germany. Assignor to Farbenfabriken of Elberfeld Co., New York, N. Y. Blue triphenylmethane dye, made by condensing dibenzyl-*m*-xylidine-disulphonic acid with tetraalkyl-*p*-diaminobenzhydrols, oxidizing the resulting leuco-compounds, and isolating the sulphonic acids thus produced as alkaline salts. They are dark powders with a metallic luster, giving blue solution in water, dyeing wool from acid-baths clear blue shades.

676,663. John Patten, Baltimore, Md. Assignor to Patten Vacuum Ice Machine Co., same place. Apparatus for concentrating acids. The combination of a tank provided with a pipe coil and means for heating the same, with a pipe for delivering dilute acid around the coil, means for draining off the acid from the tank, a reservoir located above the apparatus, means for forcing the acid to the reservoir, and means for maintaining a vacuum in the tank above the surface of the acid.

676,664. Same parties as above. Concentrator for acids. A horizontal vapor tube and series of concentrating vessels supported upon and above said tube, and arranged to discharge vapor downward into the same, means for circulating acid through and heating it in said vessels, said tube being adapted to hold a layer of fluid material which may protect its bottom against acid carried over from the concentrating vessels.

676,679. Francis E. Elmore, Leeds, England. Process of separating metallic constituents from ore, which consists in mixing pulverized ore with a large quantity of water to maintain the mixture in a freely flowing condition, adding a thick oil adapted to adhere to the metallic constituents, but not to the wet rocky constituents, settling the rock and floating off the oil over the body of water carrying with it the metal, and finally separating the metal from the oil by centrifugal action.

676,828. Sigmund Willner, Rahway, N. J. Assignor to the Willner Wood Co., same place. An insoluble gelatinous body containing aldehyde, with lead acetate, gum and alum, and an applied protective coating of a mixture of paraffin and gutta percha.

JUNE 25, 1901.

676,850. Fritz Ach, Mannheim, Germany. Assignor to C. F. Boehringer & Soehne, Mannheim, Germany. Amino tartronic acid of the aromatic series, which is a bibasic acid that on heating turns first yellow, then darkens, and finally decomposes without melting, and which reduces silver solutions with the formation of

Digitized by Google

a silver mirror, made by heating a condensation product of alloxan and an aromatic base with alkali, dissolving the product in water, acidulating and adding alcohol, dissolving the resultant acid alkali salt of aminophenyltartronic acid in alkali and water, decolorizing and filtering, then adding a mineral acid.

676,860. Fritz Ach, as above. Paraaminophenylglyoxylic acid, readily soluble in warm alcohol and hot water, also in alkaline carbonates and alkalies, including ammonia, also in warm dilute mineral acids, difficultly soluble in ether and benzene, no melting-point; turns brown on heating to 170° C., softens at 190° C., on further raising the temperatures, becomes of a light color and decomposes above 400° C. Made by introducing the acid salt of *p*-aminophenyltartronic acid into a heated mixture of manganese dioxide and water, with agitation, boiling and filtering, evaporating and adding mineral acid till weakly acid to congo paper, cooling, redissolving and rapidly cooling, whereby the acid is thrown out in circular crystals.

676,861. Lorenz Ach, otherwise as above. Process of making alkalized purins. Consists in dissolving dichlor oxypurin in caustic potash solution, adding alcohol, cooling and treating with methyl iodide, cooling and evaporating the alcohol.

676,862 Lorenz Ach, all as above. Aromatic aminoaldehydes, made by adding an alkalized anilalloxan to heated sulphuric acid, stirring, and when evolution of gas has ceased, pouring the whole into water, extracting with ether, and finally distilling the product with superheated steam. Specifically, *p*-amino-*m*-methoxybenzaldehyde, forming yellow acicular crystals melting at 101° to 102°, and sensitive to light.

676,863. Lorenz Ach. Assignor as above. Alloxanphenol, crystallizing readily, soluble in alcohol and warm water, decomposing at its melting temperature. Made by mixing and agitating solutions of phenol and alloxan, introducing a stream of hydrochloric acid and maintaining a low temperature till a clear solution results.

676,864. Lorenz Ach. Assignor as above. Oxyphenyltartronic acids, which are very unstable, soluble in water, and decomposing easily with evolution of carbon dioxide, and forming a silver mirror by reduction with ammoniacal silver solution. Made by heating and stirring a condensation product of phenol and alloxan in alkaline solution over a water-bath, acidulating with acetic or a similar acid, concentrating somewhat and adding alcohol to precipitate the alkali salt of the acid.

676,873. Carl C. L. G. Budde, Copenhagen, Denmark. Assignor to Soren Lemvig Fog and Aage Georg Kirschner, same place. Process of making matches, consisting in saturating the splint with water, applying barium chlorate and afterwards a

Digitized by Google

mixture of potassium bichromate, potassium chlorate, sulphur and oxide of copper.

676,874. To same party for the article made as above.

677,012. George H. Benjamin, New York, N. Y. Art of making celluloid, by freezing the pyroxylin and camphor, grinding and intimately mixing them, introducing the solvent, and increasing the temperature of the mass.

677,089. John C. Kessler, Milwaukee, Wis. Process of extracting copper from ores or tailings. Treats the tailings in an open vat with a solution of a copper salt in ammonia, covers the solution with water, when saturated the lower solution is drawn off and half the copper precipitated by electrolysis, the solution is then returned to the vat and finally all the copper is precipitated and the weak ammonia used over again.

677,207. Charles M. Hall, Niagara Falls, N. Y. Process of purifying bauxite. Fuses the bauxite in an electric furnace with carbon, causes the iron and silicon to unite and be reduced, and draws off the purified alumina. May add iron.

677,208. Charles M. Hall, Niagara Falls, N. Y. May use aluminum as reducing agent in above process.

677,209. Charles M. Hall, Niagara Falls, N. Y. Purified crystalline alumina, free from silica and iron, has a crystalline structure and contains a higher proportion of aluminum than would be required for the formula Al_2O_3.

677,227 to 677,231, inclusive, are all to Paul Julius, Ludwigshafen, Germany. Assignor to Badische Anilin und Soda Fabrik, same place. Disazo dyes, from diaminophenolsulpho acid and the following components: 2–3–6 naphtholdisulpho acid and β-naphthol.

677,228. 2,7-naphtholsulpho acid and β-naphthol.

677,229. 2,7-dihydroxynaphthalene and β-naphthol.

677,230. β-hydroxynaphthoic acid and β-naphthol.

677,231. *o-o*-Diaminophenol-*p*-sulpho acid one molecule and two of β-naphthol. They give violet to bluish shades on wool from an acid-bath, changing color and becoming faster on boiling with bichromate; they are soluble in water, and on reduction regenerate their constituents.

677,239. Rudolph Knietsch and Robert Holdmann, Ludwigshafen, Germany. Assignors to the Badische Anilin und Soda Fabrik, same place. Halogen substituted indigo, made by treating *p*-chlor-*o*-nitrobenzaldehyde with acetone and an alkali, giving *p*-dichlorindigo that sublimes on heating, evolving violet-red vapors, and dyeing wool from the acid bath blue.

677,240. To same parties as above. Halogen indigo sulpho acid, containing chlorine, dissolving blue in water, turing brown-

Digitized by Google

yellow on adding caustic soda, its barium salt being difficultly soluble in water and its calcium salt readily soluble.

677,279. Friedrich Runkel, Elberfeld, Germany. Assignor to the Farbenfabriken of Elberfeld Co., New York, N. Y. Basic dye, obtained by treating certain auramins containing an alkyl radical and a hydrogen atom that can be substituted by a methyl group with a methyl indol in the presence of mineral acids and isolating the resulting dyes. They are dark brown powders readily soluble in water and alcohol with a reddish violet color not changed by the addition of mineral acids when dilute, soluble in strong sulphuric acid with a yellow-brown color, dyeing tannin mordanted cotton, wool and silk reddish violet shades, fast to the action of dilute mineral acids.

677,323. Raoul P. Pictet, New York, N. Y. Apparatus for separating oxygen and nitrogen from mixtures thereof. Applied to gases which can be liquefied and differ in volatility, and consisting of apparatus for liquefying the gases, an evaporator consisting of a closed chamber provided with a series of closed receptacles for liquefied gases that flow from one to the other, successively, and means for separating the gas evolved in the upper part of the evaporator from that evolved in the lower part thereof.

WM. H. SEAMAN.

Digitized by Google

REVIEW OF AMERICAN CHEMICAL RESEARCH.

VOL. VIII. No. 3.

WILLIAM A. NOYES, Editor.

REVIEWERS :

M. T. Bogert, Benton Dales, W. F. Hillebrand, A. A. Noyes, W. H. Seaman, E. M. Chamot, L. M. Dennis, L. P. Kinnicutt, H. N. McCoy, J. W. Richards, J. O. Schlotterbeck, B. S. Cushman, A. H. Gill, H. W. Lawson, S. P. Sadtler, F. P. Underhill.

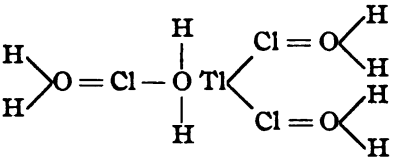
INORGANIC CHEMISTRY.

On the Decomposition of Hydrogen Peroxide by Various Substances at High Temperatures. BY J. H. KASTLE AND MARY E. CLARKE. *Am. Chem. J.*, **26**, 518–526.—The extent of the decomposition of the hydrogen dioxide was determined by noting the volume of oxygen evolved when 5 cc. of a 15-volume solution was heated at 100° with 5 cc. of dilute solutions of various substances. Some substances, as chlorides and bromides of the alkalies, zinc and mercury oxides and aluminum hydroxide, have but little more effect than pure water. The following decompose hydrogen peroxide rapidly : Sulphates, and double sulphates with potassium and ammonium, of aluminum, cobalt, copper, chromium, iron, and nickel; potassium chromate and bichromate, lead peroxide and sulphuric acid. In some of these cases, the decomposition is due to a definite chemical reaction; in other cases, the action is catalytic. Copper sulphate and potassium chromate are very active, one or two parts per million being sufficient to decompose hydrogen peroxide rather rapidly at 100°. H. N. McCOY.

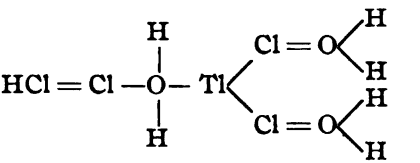
On Some Complex Compounds of Thallium and the Constitution of Double Salts. BY ALLERTON S. CUSHMAN. *Am. Chem. J.*, **26**, 505–518 (second paper).—The author finds that all of the chlorine in thallic chloride is precipitated by silver nitrate in the gravimetric process of analysis. The incomplete precipitation of chlorine in the determination by Volhard's method is ascribed to an oxidizing action of thallic salts on the sulphocyanate, with consequent formation of potassium cyanide. In opposition to Meyer, the author, therefore, believes that thallic chloride should not be represented by the formula $(TlCl)Cl_2$. The tetrahydrate $TlCl_3.4H_2O$ is found not to be hydroscopic. Over sulphuric acid or phosphorus pentoxide, the tetrahydrate loses water. Finally chlorine is given off before dehydration is com-

Digitized by Google

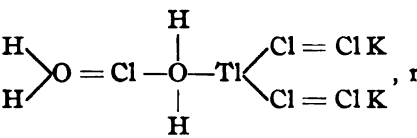
plete. The pure monohydrate could not be isolated. To explain the loss of chlorine with the last molecule of water, the following formula is proposed :



The compounds $TlCl_3.HCl.3H_2O$ and $TlCl_3.KCl.2H_2O$ are written thus :



and



, respectively.

Thallic chloride tetrahydrate crystallizes from ether almost unchanged. The crystals contain only a small amount of ether.

H. N. McCoy.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

The Recalculation of the Chemical Analyses of Rocks. By J. F. Kemp. *School of Mines Quarterly*, **22**, 75–78.—For the purpose of lightening the work of calculating the mineral composition of rocks from their chemical analyses, aided by a study of thin sections, the author has prepared a series of tables by which the molecular proportion of any of the more abundant component oxides of a rock may at once be found by looking up the given percentage in the table. The tables will doubtless prove extremely useful. W. F. Hillebrand.

The Action of Ammonium Chloride upon Certain Silicates. By F. W. Clarke and George Steiger. *Am. J. Sci.*, **13**, 27–38.—In continuation of their earlier work (this Journal, Abstracts, **22**, 121; **23**, 73) the authors find that in stilbite, heulandite, and chabazite the alkalies and lime can be largely replaced by ammonium, though to a less extent than happened with analcite and natrolite, and that with thomsonite the change was still less, though large. Of three iron silicates ilvaite is very strongly, riebeckite (?) moderately, and aegirite only slightly attacked by

Digitized by Google

ammonium chloride, but without formation of definite ammonium compounds. Serpentine, leuchtenbergite, and phlogopite were but slightly attacked and no ammonium compounds resulted. A hitherto unpublished analysis of ilvaite from the Golconda Mine, South Mountain, Owyhee County, Idaho, by the reviewer, and one of aegirite from Magnet Cove, Arkansas, by Steiger, accompany the paper. W. F. HILLEBRAND.

The Foyaite-Ijolite Series of Magnet Cove: A Chemical Study in Differentiation. BY HENRY S. WASHINGTON. *J. Geol.*, 9, 607–622 and 645–670.—In the belief that a succession of analyses more exhaustive than those already existing of the rocks of the igneous complex of Magnet Cove would lead to results as satisfactory as those obtained by Pirsson for rocks of the Little Belt Mountains, of Montana, in showing a regular gradation from the center to the periphery, thus affording an excellent example of the differentiation of a magma in place, the author has made new analyses which fully justify his belief. This complex is anomalous in that it is less basic at the borders than at the center. Detailed analyses by the author of six representative rocks of Magnet Cove and two of Fourche Mountain are given, besides a number from other sources for comparison. The rocks analyzed are pulaskite, foyaite, covite, arkite, ijolite, biotite-ijolite, and jacupiraugite. Two new names in this list will strike the reader. Covite is applied to a rock previously placed by the author provisionally with the shonkinites. "Accepting Pirsson's definition of shonkinite as the standard (*viz.*, melanocratic combination of alkali-feldspar with pyroxenite), the covites are the rocks which correspond to Rosenbusch's definition of shonkinite." The name arkite (from the usual abbreviation for Arkansas) is proposed for a "holocrystalline, porphyritic, leucocratic combination of leucite (or pseudo-leucite) and nephelite, with pyroxene and garnet." On the basis of the analyses the author discusses at length, with the aid of diagrams, the problems of differentiation here presented, and methods for arriving at the probable composition of the original magma in this and other cases are considered. "The methods indicated certainly put the study of rock differentiation upon a purely mathematical basis, which in the hands of a competently mathematical petrographer should surely lead to an exact quantitative knowledge of the laws which control this, and very probably, with the aid of physical chemistry, to a knowledge of the rationale of the process." Occasion is taken to indorse Pirsson's remarks (*20th Ann. Rep. U. S. Geol. Sur., Part II*, p. 359, ff.) on the great importance of good and complete analyses and to deplore their comparative rarity.
W. F. HILLEBRAND.

A Review of the Chemical Constitution of Tourmaline as Interpreted by Penfield, Foote and Clarke. BY JOSEPH HYDE

Digitized by Google

PRATT. *J. Elisha Mitchell Sci. Soc.* 17th year. Part second. 1901, pp. 1–5.—The decision is in favor of Penfield's theory, but the author is in error when he says that Clarke gave apparently as much weight to the older analyses as to the recent more trustworthy ones. W. F. HILLEBRAND.

A Peculiar Iron of Supposed Meteoric Origin, from Davidson County, North Carolina. BY JOSEPH HYDE PRATT. *J. Elisha Mitchell Sci. Soc.* 17th year. Part second. 1901. pp. 21–26.—This is an account of a peculiar iron that weighed, when found in a region far distant from railways, 13 pounds, 14 ounces. It gives neither Widmanstätten figures nor Neumann lines, but the etched surface presents, according to Mr. Wirt Tassin, of the U. S. Nat. Mus., "a granular or stippled appearance overlaid with a network of fine lines. These lines are apparently without orientation and are so numerous as to give the iron a decidedly fibrous appearance." In this last respect it resembles the Scriba iron from Oswego County, New York, but differs from all other structureless irons. Its chemical composition, determined by Baskerville, is also against its cosmic origin; namely, Fe metallic, 92.10; Fe combined with C, 1.17; Fe combined with Si, 0.62; Mn, 0.92; Ni, 0.30; Co, 0.34; Si, 0.62; C, 3.88. S, P, Al, Ti, and Cu absent. Considerable of the carbon is free. In spite of the above evidence, for reasons set forth in the paper, the author thinks that it is of cosmic origin and proposes for it the name "Cid" iron, from a near-by settlement of that name. W. F. HILLEBRAND.

The Granitic Rocks of Georgia and Their Relationships. BY THOMAS LEONARD WATSON. *Am. Geologist*, **27**, 199–225.—This paper contains very many analyses by the author of granitoid rocks which he subdivides into (*a*) even-grained, normal, massive granites, (*b*) porphyritic granites, and (*c*) granite gneisses, this last term being used "to denote gneisses derived from massive granites by metamorphism and therefore igneous in origin as contrasted with those gneisses of known sedimentary origin." The analyses, however, omit all the minor constituents, the oxides of iron are not determined separately, and water is represented by ignition loss. A marked feature of the rocks is the entire absence of hornblende. There is a plain relationship both mineralogically and chemically to the granites in the Atlantic coast region farther north. All the evidence points to the gneisses being altered igneous rocks. W. F. HILLEBRAND.

The Georgia Bauxite Deposits: Their Chemical Constitution and Genesis. BY THOMAS LEONARD WATSON. *Am. Geologist*, **28**, 25–45.—With exception of a number of analyses from which the author concludes that the Georgia-Alabama bauxite in its present state is essentially the trihydrate of alumina, this paper contains little that is new. From a careful study of the region he is led

Digitized by Google

to adopt the views of C. W. Hayes, as against those of J. W. Spencer with regard to the origin of the deposits. Oxygenated surface waters gained access by faults, etc., to the pyritiferous Connasauga shales underlying the limestone of the region, and in their upward passage brought sulphates of iron and aluminum with them. These solutions passing through great thicknesses of limestone underwent chemical change with precipitation of ferric and aluminum hydroxide, and basic aluminum sulphate, and issued as springs, probably thermal. The aluminum hydroxide, produced as described by Hayes, formed a gelatinous precipitate which collected in pisolitic forms about the vents of these springs. W. F. HILLEBRAND.

A Short Discussion of the Origin of the Coal Measures Fire-Clays. BY T. C. HOPKINS. *Am. Geologist*, **28**, 47–51.—"The explanation commonly offered for the origin of the blue fire-clays of the coal measures is that they are the soils on which grew the vegetation that forms the coal seams lying on top of them, and the reducing and leaching action of the vegetable acids from the living and decaying vegetation has changed the common clay to the refractory fire-clay." To meet certain objections set forth in the paper the author concludes "that the occurrence of a not inconsiderable portion of the fire-clays is better explained by considering them as transported clays reduced before deposition. . . . . Furthermore, the refractory quality of many of the clays has been increased probably since the elevation of the land areas by a leaching out of the fluxing materials due in part to the topographical position of the beds near the hilltops and in part to a stratigraphical position that permits the access of the acidulated waters." W. F. HILLEBRAND.

The Basic Rocks of Northeastern Maryland and Their Relation to the Granite. BY ALFRED GRAY LEONARD. *Am. Geologist*, **28**, 135–176.—The rocks described were taken from that portion lying east of the Susquehanna River of a narrow belt extending southwesterly from a point in Cecil County, 11 miles west of the Delaware line to a point about 15 miles northeast of Baltimore. They are representative of the entire belt and possess special interest because of their close connection with the granites bordering on the south. "The Northeastern Maryland area taken as a whole seems to furnish an example of the occurrence of several rock types which represent the facies of a single magma and unite to form a geological unit," but it is not assumed that all were formed at the same time or by a continuous eruption. The series includes quartz-mica-hornblende-diorite, quartz-diorite, noryte, gabbro, pyroxenite, serpentine, and diabase. Five new and detailed analyses by the reviewer are given of two varieties of quartz-mica-hornblende-diorite, of a hornblende diorite poor in quartz, a noryte, and websterite; three others of a granite, biotite

Digitized by Google

granite, and serpentine by different analysts are reproduced from earlier publications. Numerous pegmatite dikes and quartz and other veins—some commercially exploited for quartz and feldspar—cut the basic and ultrabasic rocks, and these are somewhat briefly discussed. W. F. HILLEBRAND.

The Cleveland Water Supply Tunnel. BY S. J. PIERCE. *Am. Geologist*, **28**, 380–385.—The chemical matter of this paper consists of three analyses by Prof. A. W. Smith, of quicksand and of clay taken from a point 7,900 feet from shore, and of clay 19,600 feet from shore, under Lake Erie. The formation seems to be similar to the clay forming the bluffs along the lake and is stratified throughout by innumerable very thin strata of dry quicksand. W. F. HILLEBRAND.

Geology of the Shonkin Sag and Palisade Butte Laccoliths in the Highwood Mountains of Montana. BY W. H. WEED AND L. V. PIRSSON. *Am. J. Sci.*, **12**, 1–17.—These laccoliths, especially that of the Shonkin Sag, a relatively flat one, afford one of the best and most conclusive examples of the differentiation of igneous rocks yet described, this differentiation having been produced within the body itself after its injection as a homogeneous magma. The following sections illustrate the transitions:

	Center. Feet.	Outer-wall. Feet.
Leucite basalt porphyry	5	10–15
Dense shonkinite	5	.....
Shonkinite	5–6	.....
Transition rock	3	.....
Syenite	25–30	.....
Transition rock	15	.....
Shonkinite	60–75	75
Leucite basalt porphyry	15	15

A complete analysis of the shonkinite and a partial one of the syenite, both by the reviewer, are used in support of the authors' argument. W. F. HILLEBRAND.

On the Manganese Ore Deposits of the Queluz (Lafayette) District, Minas Geraes, Brazil. BY ORVILLE A. DERBY. *Am. J. Sci.*, **12**, 18–32.—These "are residual deposits derived through decomposition and leaching from an original type, or types, of rock in which manganese garnet was the most constant and characteristic silicate element." The occurrence and associations at each one of several localities are very fully described. An analysis by Dr. Florence of one phase of the garnet rock from Piquiry shows: SiO_2, 38.47; Al_2O_3, 21.07; Fe_2O_3, 7.38; MnO, 27.90; CaO, 4.70. At the Morro da Mina a sound rock from a prospecting tunnel, composed essentially "of a hard, prismatic, cleavable manganese oxide with a manganese garnet, both being primary elements," has, according to Dr. Florence, the following partial composition: Insol., 20.78; SiO_2, 0.77; Fe_2O_3, 5.79;

Digitized by Google

NiOCoO, 0.30; MnO, 8.54; MnO_2, 57.38; P_2O_5, 0.08; CaO, 0.49; MgO, 0.20; H_2O, 3.91. W. F. HILLEBRAND.

On Calaverite. BY S. L. PENFIELD AND W. E. FORD. *Am. J. Sci.*, 12, 225–246.—At the conclusion of this paper in which the authors say that their crystals of this remarkable mineral "seem almost to present a contradiction to some of the laws of crystallography," there is given a simple chemical test to distinguish between sylvanite and calaverite. The mineral is boiled with concentrated nitric acid. The decanted solution when diluted and tested with hydrochloric acid gives a curdy precipitate if sylvanite; very little precipitate or merely a turbidity if calaverite. There are two analyses by Penfield of material from Cripple Creek, Colorado. They show:

Au.	Ag.	Te (diff.)	Sp. gr.
40.99	1.74	57.25	9.328
42.77	0.40	56.75	9.388

The ratio is in each case Au + Ag : Te as 0.98 : 2.00. The densities are somewhat higher than heretofore observed, probably because of purer material. W. F. HILLEBRAND.

Native Copper Near Enid, Oklahoma. BY ERASMUS HAWORTH AND JOHN BENNETT. *Bull. Geol. Soc. Am.*, 12, 2–4.—The copper was found in a 6 inch stratum of the Red Beds at a depth of 32 feet while digging a well. It occurs in thin foil-like sheets from a half-inch to 2 inches in width, filling crevices in the clay shale. Nothing is known of the cause of precipitation nor of the original source of the copper.

W. F. HILLEBRAND.

Andesitic Rocks Near Silverton, Colorado. BY FRANK R. VAN HORN. *Bull. Geol. Soc. Am.*, 12, 4–9.—Nine analyses by E. B. Gebhardt, W. G. Haldane, E. O. Cross and E. B. Willard, of far from fresh hornblende-andesites, and showing only the commoner constituents, accompany this paper.

W. F. HILLEBRAND.

Weathering of Granitic Rocks in Georgia. BY THOMAS L. WATSON. *Bull. Geol. Soc. Am.*, 12, 93–108.—This paper is preliminary to a full discussion which is to appear in a report on the granites and gneisses of Georgia (see also "The Granitic Rocks of Georgia and Their Relationships," abstract in this Journal, 24, 120). Analyses are lacking in this paper, but the results of comparing those of fresh and decomposed rocks are given, and also a table showing the losses taking place during decomposition according as insolubility is assumed for Fe_2O_3, Al_2O_3, or $Fe_2O_3 + Al_2O_3$. The cause of the red color of soil is also briefly considered.

W. F. HILLEBRAND.

Digitized by Google

The Keweenawan Area of Eastern Minnesota. By C. W. HALL. *Bull. Geol. Soc. Am.*, **12**, 313–342.—**The Keewatin Area of Eastern and Central Minnesota.** By C. W. HALL. *Bull. Geol. Soc. Am.*, **12**, 343–376.—There is little of a chemical nature in these papers.

Geology of Rigaud Mountain, Canada. By OSMOND EDGAR LEROY. *Bull. Geol. Soc. Am.*, **12**, 377–394.—Mt. Rigaud in the northwestern part of Vaudreuil County, Quebec, is the most western of a line of hills of igneous origin (see "On the Petrography of Shefford Mountain," abstract in this Journal, **24**, 6). Its age is in doubt, that of the others being post-Silurian. It probably has no genetic connection with the rest of the series, and "is composed mainly of a normal hornblende-syenite pierced in the northwest by an area of porphyry," while "the other hills, so far as known, consist of an alkali-rich syenite, associated with a basic rock of the same petrographical province, such as theralite, or essexite, both of which are totally different from the Rigaud rocks." Rather unsatisfactory analyses are given of quartz-syenite porphyry and quartz porphyry from Rigaud.

W. F. HILLEBRAND.

Feldspar-Corundum Rock from Plumas County, California. By ANDREW C. LAWSON. *Bull. Geol. Soc. Am.*, **12**, 501.—The rock apparently belongs to the series of feldspathic "albitic" dikes, cutting serpentine in the Sierra Nevada. It "is composed of 84 per cent. oligoclase and 16 per cent. corundum in crystals up to over 2 inches in length." The feldspar shows: SiO_2, 61.36; Al_2O_3, 22.97; Na_2O, 8.08; CaO, 5.38; H_2O, 1.72. Sp. gr., 2.63.

W. F. HILLEBRAND.

Mineralogical Notes. By ARTHUR S. EAKLE. *Bull. Dept. Geol., Univ. California*, **2**, 315–326.—Secondary minerals forming white veins in the serpentine about Fort Point, on the south shore of the entrance to San Francisco Bay, are magnesite, probably hydromagnesite, calcite, aragonite, barite, and gypsum. Not far west of the Fort, in what is probably an older basic rock included in the serpentine, are veins of pectolite and datolite, of which the crystallography and composition are given. From Siskiyou County, transparent crystals of zircon, varying in color from pale to deep wine, and with exceptionally good faces, are described. A greenish ferric sulphate derived from marcasite, from the Redington mercury mine, Knoxville, is referred to coquimbite, much of the iron being replaced by aluminum, but about 3 per cent. of monoxide bases are disregarded. Altaite, PbTe, formerly known only in cubes, is found in the Birney pocket mine, Sawmill Flat, Tuolumne County, with octahedral and trapezohedral faces in addition.

Esmeraldaite is the name given to what is supposed to be a

Digitized by Google

new ferric hydroxide found in pod-shaped masses embedded in a yellowish-brown earthy material from Esmeralda County, Nevada. It is coal-black with bright vitreous luster, translucent in thin splinters with a yellowish red color, and very brittle. The fracture is conchoidal, the hardness 2.5, streak yellowish brown, sp. gr., 2.578. The mean of several analyses is reported as Fe_2O_3, 56.14; Al_2O_3, 5.77; CaO, 3.35; P_2O_5, 4.49; organic, 1.37; SiO_2, 2.05; H_2O at 110°, 15.94; H_2O over 110°, 10.24; total, 99.35. Disregarding everything but the sesquioxides and water, the ratio for $R_2O_3 : H_2O$ is 1 : 4.14.

All the analyses are by W. T. Scheller.

W. F. HILLEBRAND.

Contributions to the Mineralogy of California. BY WALTER C. BLASDALE. *Bull. Dept. Geol., Univ. of California*, **2**, 327–348. —Few of the Coast Range minerals have been closely studied and this work was undertaken to acquire wider knowledge of them, especially of the rock-making constituents. The specimens described all came from either one of two localities in the Berkeley Hills, across the bay from San Francisco. From the analyses of a green hornblende which the author refers to actinolite, and from other analyses of this mineral, it is concluded that water of constitution must be considered in any theory of the constitution of the hornblende group, an idea which is by no means new. A blue hornblende, optically and chemically closely resembling glaucophane, differs from Palache's crossite only in optical orientation and in the fact that the proportions of Al_2O_3 and Fe_2O_3 are reversed. A considerable percentage of water is, as with actinolite, regarded as essential. Tremolite, prochlorite, talc, diallage fresh and altered, serpentinized anthophyllite, and albite are also described and analyzed. The probable relationships of the above minerals are also considered. W. F. HILLEBRAND.

Geology and Water Resources of Nez Perce County, Idaho. BY ISRAEL COOK RUSSELL. *Water Supply and Irrigation Papers of the U. S. Geol. Survey, Nos.* 53 and 54, 141 pp.—The geology, physiography, water supply, and economic geology of this region receive full discussion, in the course of which several analyses, in part new, are given. A volcanic dust from Cottonwood Canyon, analyzed by the reviewer, is found to be "richer in silica, potash, and soda than the basalt which forms the Columbia River lava." Dr. G. P. Merrill furnishes analyses of this basaltic lava, and of a subsoil and soil from Walla Walla and Dayton, in the State of Washington. In part illustration of the economic resources analyses appear of nearly pure limestones, one by Geo. Steiger, two by the reviewer, also of lignite from Grande Ronde River, Roslyn, and Clealum in Washington. In an appendix on notes concerning Portland cement are some analytical data furnished by Prof. E. D. Campbell, of Michigan.

W. F. HILLEBRAND.

Digitized by Google

Preliminary Notes on the Occurrence of Serpentine and Talc at Easton, Pennsylvania. By F. B. Peck. *Ann. New York Acad. Sci.*, 13, 419–427.—Contains an analysis of a post-Algonkian dolomite, of an augite approaching aegirine, and of an augite-syenite unusually high in magnesia and lime.

W. F. Hillebrand.

The Serpentines of Manhattan Island and Vicinity and Their Accompanying Minerals. By D. H. Newland. *School of Mines Quarterly*, 22, 307–317 and 399–410.—These serpentines have hitherto received little study by modern methods. The author discusses the geological features, and general and microscopic characters of the serpentines from Staten Island, Hoboken, and New Rochelle, with brief reference to those from Tenth Avenue, Aqueduct Shaft No. 26, and Rye, and inclines to the old view of Mather that they are modified eruptives. Original analyses by G. O. Goodell, and a number of reproduced analyses of some of the associated minerals accompany the paper.

W. F. Hillebrand.

Maryland Geological Survey, Eocene. By Wm. Bullock Clark and Geo. Curtis Martin. 331 pp. The chemical matter of this report is covered by three analyses of marls from Woodstock, Aquia Creek, and Winchester, made by Dr. P. Fireman.

W. F. Hillebrand.

The Zinc and Lead Regions of North Arkansas. By John C. Branner. *Ann. Rep. Geol. Survey, Arkansas*, 1892, Vol. V, 395 pp.—Delayed for nearly ten years by lack of an appropriation for printing, this valuable report has finally issued from the press. Although forming a part of the report for 1892, it contains much information gathered in the field as late as 1900. Among the zinc minerals found, sphalerite of high grade and purity, smithsonite, and calamine are the chief ores, named in order of importance. The sulphide deposits are of three classes (bedded, vein, breccia), with the oxidized ores as a fourth class. The general conclusions regarding the ores are in part as follows: The original deposition of the zinc was in sedimentary beds, mostly of organic origin; much of the ore in the beds has since changed position more or less and this change is still going on, by means of which secondary deposits filling fissures have been formed along synclinal troughs, fault planes, and in breccias. Throughout the report, and particularly in the chapter on the minerals of the region, are to be found many analyses. Among those perhaps not already elsewhere published, may be noted several of the so-called "tallow clays," which are found also in the mining regions of some other states and are apparently mixtures of clay and calamine carrying as high as 37.5 per cent. of

Digitized by Google

zinc oxide, but are not available for smelting. The so-called "turkey fat" is a smithsonite colored by cadmium sulphide.

W. F. HILLEBRAND.

Geological Survey of New Jersey. *Ann. Rept. of the State Geologist for the Year 1900.* xl + 231 pp.—The sections of greatest interest to the chemist are those on the "Portland Cement Industry," by Henry B. Kümmel, "Mineralogical Notes and Explorations," by Albert H. Chester, and "Chlorine in the Natural Waters of the State," by Wm. S. Myers. In the first of these, after an introductory chapter on natural and Portland cement in which the composition of many domestic and foreign raw materials and finished products are tabulated, the rock formations of the Kittatinny Valley and their structural relations to each other are discussed in detail, and illustrated by many sketch maps, and analyses of cement rock, limestone, shale and marl by Prof. Wm. S. Myers, who is also responsible for the numerous mineral analyses in the section on "Mineralogical Notes," etc. Of some interest is the finding of a hydrous calcium-magnesium carbonate of white or creamy color and porcelain-like appearance.

W. F. HILLEBRAND.

The El Paso Tin Deposits. BY WALTER HARVEY WEED. *U. S. Geol. Survey, Bull. No.* 178, 1901, 15 pp.—These deposits lie about 10 miles north of El Paso, Texas, on the eastern flank of the Franklin Mountains. Three veins have been found and opened by pits and cuts. Near the surface they are well defined and of value, but seem to disappear at about 50 feet in depth. It is thought, however, that this disappearance is due to slipping or faulting, and that cross-cutting will bring the veins to view again. The veins are in a normal granite (soda), and have the characteristics of those of Europe, but lack the topaz which is elsewhere associated with cassiterite veins. They are clearly due to metasomatic processes, but the evidence of pneumatolytic origin is not conclusive.

W. F. HILLEBRAND.

The Occurrence and Distribution of Corundum in the United States. BY JOSEPH HYDE PRATT. *U. S. Geol. Survey, Bull. No.* 180, 1901, 98 pp.—This comprehensive report can be but imperfectly noticed. Fifteen modes of occurrence are first described, showing a much greater variety than was formerly supposed. The large concentrated masses are, however, confined to the basic magnesian rocks. The distribution is then taken up, first of gem occurrences, then of corundum, and last of emery. Then follow sections on methods of mining and cleaning, and uses, and the report closes with a detailed list of corundum localities in the United States, and briefer mention of those of foreign countries. Maps, photographs, and crystal drawings illustrate the report.

W. F. HILLEBRAND.

Digitized by Google

Mineral Resources of the U. S., 1900. 927 pp. By DAVID T. DAY.—This publication reverts now to its original form as a separate publication of the Geological Survey, and no longer forms part of the annual report. It contains the usual statistical information on a great variety of subjects from which a few papers containing matter of chemical interest are selected for notice. Several of the reports appear in very much more condensed form than when issued as advanced extras, and as a consequence some chemical matter reproduced from other sources which appeared in the extras is omitted from the bound volume.

Iron Ores, pp. 39–67. By JOHN BIRKINBINE.—Contains 346 cargo analyses of Lake Superior ores.

Manganese Ores, pp. 115–140. By JOHN BIRKINBINE.—An analysis of ore shipped from the Heberlin mine, Tennessee (Mn, 53.735; Fe, 2.085; SiO_2, 1.30; P, 0.008), and a few analyses of cargo samples of Brazilian and other foreign ores, made by London analysts, accompany this report.

Platinum, pp. 233–234.—As a result of an extended search by Dr. David T. Day of known and reported localities for platinum on the Pacific coast and in Idaho and Montana, this metal was found in some quantity only in the placers of Plumas, Shasta, Trinity, and Siskiyou Counties, California, though it occurs often in Alaska, Oregon, Idaho, and Montana. Chromite is nearly always found with the platinum, and extensive serpentine deposits containing chromite exist in many of the mountain ranges where the placer streams head. Since platinum, wherever found in place, is associated with chromite and disseminated through a basic magnesian rock of which serpentine is a common alteration product, it is to be hoped that it will be found *in situ* not only on the Pacific coast but in the Appalachian region as well.

Tungsten, *Molybdenum*, *Uranium*, *Vanadium*, pp. 257–265. By JOSEPH HYDE PRATT.—The notes on uranium and vanadium are largely from the publication of Hillebrand and Ransome on carnotite, etc., from Colorado, and include the analyses.

An Occurrence of Stream Tin in the York Region, Alaska, pp. 267–271. By A. H. BROOKS.—This is as yet of scientific rather than commercial interest, as no paying deposits have been discovered thus far. Two localities were noted. The first is on Buhner Creek, a westerly tributary of the Anikovik River about 10 miles east of Cape Prince of Wales. The second locality is on the Anikovik River, about half a mile below Buhner Creek. No evidence was found of any connection with acid intrusive rocks, and so far as known, there are no rocks of this kind within the drainage area of the streams furnishing the tin. A sample of concentrate in a miner's sluice box gave 90 per cent. cassiterite, 5 per cent. magnetite, the balance ilmenite, limonite, pyrite,

Digitized by Google

garnets and gold, the cassiterite being in grains and pebbles up to half an inch in diameter.

Petroleum, pp. 537–627. By F. H. Oliphant.—Under Texas appear comparative fractional distillation analyses of Corsicana, Pennsylvania, and several foreign oils, from which it is seen that the first compares favorably with that from Pennsylvania.

Cement, pp. 737–748.—Under "Portland Cement," by Spencer B. Newberry, appear analyses of lime waste and calcareous clay used at Wyandotte, Michigan, of Helderburg limestone and clay at Smith's Landing, New York, and of Portland cement from Evansville, Pennsylvania. Under "Slag Cement in Alabama," by E. C. Eckel, is an analysis of slag cement from Ensley, Alabama.

Talc and Soapstone, pp. 779–786. By Joseph Hyde Pratt.—For a number of reasons the author regards the talc deposits of Cherokee and Swain counties, in North Carolina, as derived from tremolite. Analyses by Baskerville are given of three talcs from Kinsey, Hewitt, and Maltby mines, in North Carolina.

Abrasive Materials, pp. 787–801. By Joseph Hyde Pratt.—This report contains two analyses (sources not given) of pumice from Millard County, Utah, and from Nebraska.

Lithographic Stone, pp. 869–873. By S. J. Kübel.—Comparative analyses of lithographic stone from Brandenburg, Kentucky, and Solenhofen, Bavaria, made in the laboratory of the United States Geological Survey, by Geo. Steiger, show the former to be a dolomitic limestone with 6.75 per cent. magnesia, while the other is a nearly pure limestone. Which is the better has not yet been put to practical test. As a substitute, onyx from near Salt Lake City is used to a limited extent in some western cities, and for long runs on hard paper, printed dry, can be made admittedly more serviceable than the best imported stone. Zinc, and particularly aluminum, plates are also successfully used for certain classes of work as substitutes. W. F. Hillebrand.

ANALYTICAL CHEMISTRY.

The Influence of Hydrochloric Acid on the Precipitation of Cuprous Sulphocyanide. By R. G. Van Name. *Am. J. Sci.*, 163, 20–26.—In the first series of experiments the author precipitated cuprous sulphocyanide by ammonium sulphocyanide from a solution containing varying amounts of hydrochloric acid and ammonium bisulphite. The precipitate, after being collected on an asbestos filter, was dried and weighed and the copper in the filtrate and washings was determined by electrolysis and by a colorimetric ferrocyanide method.

The second series of experiments shows the solubility of

Digitized by Google

cuprous sulphocyanide in water, and in solutions of ammonium sulphocyanide, ammonium sulphocyanide containing hydrochloric acid, ammonium chloride, and ammonium chloride containing ammonium sulphocyanide.

The results show that the precipitation of cuprous sulphocyanide can be made practically complete even in the presence of an excess of free hydrochloric acid or ammonium salts by adding a considerable excess of ammonium sulphocyanide. Ammonium hydroxide may be used in addition to ammonium bisulphite to aid in neutralizing any free hydrochloric acid in the solution and when sulphur dioxide is used instead of ammonium bisulphite "ammonia is in many cases desirable." If the amount of free acid is very large the greater part of it should be removed before precipitating the copper. B. S. CUSHMAN.

The Estimation of Molybdic Acid Reduced By Hydriodic Acid.—BY F. A. GOOCH AND O. S. PULMAN, JR. *Am. J. Sci.*, **162**, 449–452.—The solution of the molybdate which has been reduced by hydrochloric and hydriodic acids is oxidized with a solution of potassium permanganate. The different effects of oxidation to be expected are the immediate liberation of iodine, the production of iodic acid, some slight tendency to liberate chlorine from the hydrochloric acid, the formation of representatives of the higher oxides of manganese and, lastly, the reproduction of the molybdic acid. The liberation of chlorine may be prevented by the addition of a manganous salt; the iodine set free may be reduced to hydriodic acid by a sufficient excess of an arsenite solution; the iodic acid may be reduced in the acid solution in the same manner, and in acid solution the oxides of manganese are also reduced by this reagent. After neutralization of the solution with primary potassium carbonate, the excess of arsenite may be titrated with iodine. To the molybdate solution, reduced, cooled, and diluted, the authors add, therefore, manganous sulphate, then measured standard permanganate solution till its color appears; measured standard arsenite solution in known excess; tartaric acid to prevent the precipitation of the molybdenum compound; primary potassium carbonate to neutralize the free acid; then titrate the excess of arsenite with iodine. The amount of molybdic acid present is obtained by subtracting from the value of the permanganate (expressed in terms of molybdic acid) that of the arsenite, and adding that of the iodine. The percentage errors in the determinations given vary from 0.12 to 1.67. BENTON DALES.

BIOLOGICAL CHEMISTRY.

On the Nature of the Process of Fertilization. BY WILLIAM J. GIES. *N. Y. Med. News*, 79, 767.—The essential features of

Digitized by Google

this paper appeared in the *Am. J. Physiol*, **6**, 53, under the title of "Do Spermatozoa Contain Enzymes Having the Power of Causing Development of Mature Ova." (See This Review, **24**, 28.)
F. P. UNDERHILL.

On the Nature of Certain of the Oxidizing Ferments. BY J. H. KASTLE AND A. S. LOEVENHART. *Am. Chem. J.*, **26**, 539–567.—Oxygen is absolutely essential to the production of the guaiacum-bluing ferment of the potato, and the so-called oxidizing ferment is probably not a true soluble ferment but an organic peroxide. The oxidation phenomena occurring in plants, can be explained upon the supposition that the readily autoxidizable substances which they contain are oxidized to the peroxide condition by molecular oxygen, and that the peroxides thus formed in turn give up part of their oxygen to other less oxidizable substances present in the cell. F. P. UNDERHILL.

Some Experiments on the Intermediary Circulation of the Bile Acids. BY ALFRED C. CROFTAN, M.D. *Am. J. Med. Sci.*, **123**, 150–156.—The bile acids are normally present in human blood and in dog's blood. They evade detection by the ordinary methods since they are in combination with the leucocytes.
F. P. UNDERHILL.

The Physiological Action of Formaldehyde. BY WALDEMAR KOCH. *Am. J. Physiol.*, **6**, 325–330.—The action of formaldehyde does not depend upon active oxygen. Yeast made to grow anaërobically is killed by it in 0.05 per cent. solutions, but in 0.005 per cent. solutions is unaffected. The zymose is not affected. Proteolytic and adipolytic enzymes also are not influenced. In cases of tryptic digestion where the presence of formaldehyde has been observed to interfere with digestion, the reason may be discovered from the fact that the formaldehyde acts upon the proteids and renders them indigestible.
F. P. UNDERHILL.

A New Constituent of Bone. BY WILLIAM J. GIES. *Amer. Med.*, **2**, 820.—This new constituent has been termed osseomucoid by the author, and is practically the same as the mucoid in tendon, cartilage and other connective tissues. See also "Chemical Studies of Osseomucoid, Etc.," by Hawk and Gies, *Am. J. Physiol.*, **5**, 387–426. F. P. UNDERHILL.

Phenolphthalin as a Reagent for the Oxidizing Ferments. BY J. H. KASTLE AND O. M. SHEDD. *Am. Chem. J.*, **26**, 526–539.—Aqueous extracts of various oxidizing ferments, such as those contained in the banana, in tobacco, etc., but especially in both the common and sweet potato, if allowed to remain in contact with phenolphthalin for varying lengths of time, give the characteristic phenolphthalein reaction after the addition of so-

Digitized by Google

dium hydroxide in excess. The strength of the reaction is directly proportional to the amount of ferment present and to the length of time the extract is allowed to stand in contact with the phenolphthalin. Phenolphthalin, therefore, furnishes a reagent, which is of value in the study of the oxidizing ferments. By means of it the oxidase of the potato is found to rapidly lose its power to oxidize phenolphthalin and guaiacum. Oxidation reaches a maximum in an hour. The oxidase is distributed in all parts of the potato. Aqueous extracts of those ferments of vegetable origin that give a reaction with phenolphthalin give a reaction corresponding in intensity with guaiacum, and *vice versa*.

F. P. UNDERHILL.

Effects of Electrical Currents and the Roentgen Rays on Bacteria. *Am. Med. Asso.*, November 30, 1901; *Abst. N. Y. Med. News*, **79**, 983.—After numerous experiments made with the direct, alternating, and Tesla currents, and also with the X-ray, the following conclusions as to their influence on bacterial growth are noted by F. R. Zeit. The continuous electrical current alone has no batericidal or antiseptic properties, but can destroy bacteria only by its physical effects, heat, or chemical effects through the production of a bactericidal substance by electrolysis. A magnetic field has no effect whatever. Alternating currents favor growth and pigment production. Tesla currents, those of high potential and frequency, are only effective from the brush discharges by the production of ozone. The Roentgen rays have no direct bactericidal action. F. P. UNDERHILL.

Artificial Milks. BY LOUIS KOLIPINSKI. *N. Y. Med. News*, **79**, 979–981.—An artificial milk should approximately represent all the component parts of the animal secretion. The percentage of salts and water is of vital importance. The product should be cheap and rapidly and readily prepared. The ingredients should be easily obtainable, fresh and sterile, and the mixture palatable. A good artificial milk is made from malt extract, olive oil, roasted flour, raw egg, salts and water. The olive oil represents the fat of milk, the egg the albuminoids, fat and salts of the natural fluid. The malt extract is to emulsify the oil and is also used for its diastatic action on the flour. The roasted flour after conversion into dextrins and maltose replaces the lactose. The water is necessary for absorption.

F. P. UNDERHILL.

Physiological Action of Radium Rays. BY HENRI BECQUEREL AND P. CURIE. *Sci. Am. Suppl.*, **52**, 21,705.—The action of radiferous barium chloride contained either in sealed tubes or gutta percha sheaths, and held in the hand or carried in the pocket for a period of six to ten hours causes, at first, a slight redness of the skin near the substance. The redness conforms to the shape

Digitized by Google

of the tube and increases in intensity. The skin next falls off, the part affected sinks in, and begins to suppurate. By proper treatment, which may last for more than a month, the lesion heals and leaves a scar. In one case a similar burn was experienced, even though the substance was enclosed in a thin metallic box. In general, the duration of the effects varies with the intensity of the active rays and with the intensity of the exciting action.

F. P. UNDERHILL.

On the Biological Relationship of Proteids. BY P. A. LEVENE. *N. Y. Med. News*, 79, 981.—In confirmation of Uhlenbuth's work (*Deutsche Med. Woch.*, 1901, No. 45), Levene finds that there exists a biological relationship between the blood and the muscle proteids, or, in other words, a biological similarity between proteids having a different chemical individuality but obtained from the same animal. If rabbits are immunized for two months with milk, their serums will form precipitates with milk, casein, milk albumin, and also beef serum. The same serum will fail to produce a precipitate with the entire white of the egg, egg albumin, egg globulin, chicken serum and sheep hemoglobin. Animals receiving injections of the white of the egg for two months will form precipitates with egg albumin, egg globulin, yolk of the egg, with chicken serum and also with turkey serum. No precipitate will be formed on the addition of milk proteids, beef serum, nor of the different proteids of the latter, of guinea pig serum, nor serum of the normal rabbit. F. P. UNDERHILL.

AGRICULTURAL CHEMISTRY.

The Ash Constituents of Plants; Their Estimation and Their Importance to Agricultural Chemistry and Agriculture. BY B. TOLLENS. *U. S. Dept. Agr. Expt. Sta. Rec., Vol.* 13, pp. 207–220 and 305–317.—This is an extended critical review of the subject. Methods of preparing and analyzing the ash of plants are described and causes of variations in the amount and composition of ash are enumerated and discussed. In the determination of the more important elements in the analysis of pure ash, the author considers it convenient to use 3 aliquots, the first for the determination of the iron and alumina, and the lime and magnesia, the second for the determination of the sulphuric acid, and the third for the determination of the potash and soda. A separate solution is used for the determination of phosphoric acid and chlorine. The ash of plants as regards both amount and composition is shown to vary with the stage of growth, the thickness of the stand, the composition of the soil, the use of fertilizers, and the water content of the soil. The author considers that many researches are yet required to make the method of determining the fertilizing elements deficient in the soil by the

Digitized by Google

analysis of the ash of the plants grown therein practicable and reliable. H. W. LAWSON.

The Influence of Environment upon the Composition of the Sugar Beet. BY H. W. WILEY. *U. S. Dept. Agr., Bureau of Chem., Bull. No.* 64, pp. 1–32.—A study of the effect of climatic conditions upon the composition of the sugar beet as regards sugar content was made during the season of 1900 by the Division of Chemistry in collaboration with the Weather Bureau and the agricultural experiment stations of Indiana, Iowa, Kentucky, Michigan, New York, North Carolina, Utah, and Wisconsin. The sugar beets in all the experiments were grown from high-grade seed obtained from Austria and distributed by the Division of Chemistry. Cultural, meteorological, geodetic, and analytical data are given. The results show a close relationship between sugar content and latitude. Sugar beets grown at Raleigh, N. C., contained on an average 5.2 per cent. of sugar, while those grown at Geneva, N. Y., contained 15.5 per cent. The sugar content bore no apparent relation to the actual hours of sunshine. Diffused light was thought to be as effective in the formation of sugar as direct light. The percentage of sugar increased as the average temperature decreased. The purity of juice increased in general with the sugar content. There was a direct relationship between the sugar content and the average length of day from sunrise to sunset, the shorter the day the lower the percentage of sugar. The content of sugar was also related to the amount and distribution of rainfall, an even distribution of from 3 to 4 inches during May to August with a reduction during September and October being considered ideal conditions for the growth of sugar beets. H. W. LAWSON.

A Pot Experiment to Test Field Observations Concerning Soil Deficiencies. BY B. L. HARTWELL. *R. I. Agr. Expt. Sta. Rep.*, 1901, pp. 274–293.—Work was undertaken in connection with the Association of Official Agricultural Chemists to compare analytical methods with fertilizing and cropping as means of determining the elements of plant food deficient in soils. The data for the soil tests conducted in pots with two soils supposed to be deficient in assimilable phosphoric acid and two soils considered lacking in assimilable potash are here reported. The frequent failure of analytical results to account for differences in soils as shown by soil tests is considered as probably due in many cases to the analysis of non-representative samples. Before conducting field experiments to ascertain any deficiency in the soil it is pointed out that all other conditions, such as drainage and the mechanical condition and reaction of the soil, should be made as favorable to plant growth as is economical. The author believes that in many cases soils, which are to be used as stand-

Digitized by Google

ards in testing methods of determining assimilable plant food, should first be subjected to pot experiments.

H. W. LAWSON.

Effect of Various Systems of Fertilizing upon the Humus of the Soil. BY E. H. HESS. *Pa. Agr. Expt. Sta. Rep.*, 1900, pp. 183–206.—Determinations were made of the humus in soils which had received the following fertilizer applications for at least sixteen years: (1) No manure; (2) barnyard manure and lime; (3) lime; (4) ground limestone; (5) nitrate of soda, dissolved boneblack, and muriate of potash; and (6) sulphate of ammonia, dissolved boneblack, and muriate of potash. Lime was applied every fourth year and the other fertilizers every second year. The crops grown were corn, oats, wheat, and clover and timothy. Different methods, which are described, were compared in the determination of moisture and humus. The conclusion is drawn that the combustion method, in which the humus is determined by multiplying the amount of carbon dioxide by the factor 0.471, gives more satisfactory results than the ignition method, in which the humus is taken as the loss on ignition less the water content. The humus (*matière noire*) as determined by the method of extraction with ammonia water was decreased by the application of lime in either form. The nitrogen in the soil was decreased by a continued use of caustic lime alone and increased by the use of ground limestone. The amounts of nitrogen applied in the form of barnyard manure, nitrate of soda, and sulphate of ammonia during the experiments were, respectively, 480, 576, and 576 pounds per acre, and the corresponding amounts found in excess of that in unfertilized soil were 497, 297, and 320 pounds per acre. The ratio of nitrogen to carbon, under the different systems of fertilizing, varied only from 7.49 to 8.10 parts in 100. Notes by W. Frear on the methods of analysis used and the results obtained are appended.

H. W. LAWSON.

Analyses of Rose Soils. BY W. FREAR AND C. P. BEISTLE. *Pa. Agr. Expt. Sta. Rep.*, 1900, pp. 177–182.—Mechanical and chemical analyses of three soils used in the culture of roses are reported, with suggestions regarding the improvement of such soils.

H. W. LAWSON.

Fertilizers. *Conn. (State) Agr. Expt. Sta. Rep.*, 1901, *Part I*; *Ky. Agr. Expt. Sta. Bull., No.* 95; *Mass. (Hatch) Agr. Expt. Sta. Bull., No.* 77; *N. J. Agr. Expt. Sta. Bull., No.* 154, *Rep.*, 1900, pp. 15–133; *Pa. Dept. Agr. Bull., No.* 83.

On the Reason for the Retention of Salts near the Surface of Soils. BY THOMAS H. MEANS. *Science*, 15, No. 366, pp. 33–53.—The author made a study of the salt incrustations near the sur-

Digitized by Google

face of soils in both the humid and arid regions. In the former area they are very rare and occur usually at the end of a dry season. Several reasons are discussed that might explain the collection of the salts in the surface portions of the soil. While more water passes through a soil than is evaporated from it, the greater portion seeks the larger openings—spaces made by insects, roots, etc. When water moves upward through the soil to replace that lost by evaporation the action is entirely capillary, bringing the film around the soil grains and the salts, except possibly that portion absorbed. It would seem, therefore, that the rains do not carry the salts down far enough to prevent capillarity from again raising them to the surface during a dry season.

To eliminate the salts they should be sent downward by capillary instead of gravitational means. This may be accomplished by deep cultivation followed by flooding or by flooding the soil with frequent shallow irrigations. D. W. MAY.

PATENTS.

JULY 2, 1901.

677,385. John Tuckwell, Glasgow, Scotland. Artificial marble of Parian cement, Keemes marble cement, white silver sand, ground marble and litharge.

677,450. Fernand Gros and Paul Bourcart, Remiremont, France. Mercerizing, by making a sliver or cord of fiber strong enough to stand mercerization, stretching it taut, mercerizing it with caustic alkali, and then untwisting it.

677,514. Adolf Israel and Richard Kothe, Elberfeld, Germany. Assignors to Farbenfabriken of Elberfeld Co., New York, N. Y. Guanidine compound, made by heating a thiourea compound of aminonaphthol sulphonic acid with an amine in the presence of lead oxide. The sodium salts of these guanidine derivatives of aminonaphthol sulphonic acids are gray powders, readily soluble in hot and cold water, difficultly soluble in dilute mineral acids, and adapted to combine with diazo compounds to produce valuable dyes.

677,515. Same as above, but derived from α_1-amino-α_2-naphthol-β_4-sulphonic acid and from β_1-amino-α_4-naphthol-β_2-sulphonic acid. A gray powder soluble in cold or hot water, difficultly soluble in alcohol, insoluble in ether, and adapted to combine with one or two molecules of diazo compounds to form dyes.

677,516. To same parties as above, for red azo dye, from the above guanidine derivatives and 3 molecules of diazo compounds, a reddish brown powder, with metallic luster, solu-

Digitized by Google

tion in water red, insoluble in concentrated hydrochloric acid, but soluble in concentrated sulphuric acid with blue-red color unchanged by a little ice, but much gives a dark brown precipitate.

677,517. To same parties as above for red azo dye, from 1 molecule of the above guanidine derivatives and 2 molecules of diazo compounds such as *p*-xylidine. The dye reacts like 677,516.

677,643. Fred. G. Dietrich, Washington, D. C. Formaldehyde generator that may be set in a tumbler that holds the methyl alcohol to be vaporized, with platinized diaphragm.

677,668. Charles H. Koyl, New York, N. Y. Process of purifying water. Water containing free carbonic acid gas has lime-water added in excess, then sodium carbonate to take up the excess of lime, finally ferrous sulphate.

677,688. Spencer B. Newberry, Sandusky, Ohio. Basic firebrick compound. Tricalcium silicate, free magnesia, and no lime.

677,692. Philipp Pauli and Constantin Krauss, Hochst-on-Main, Germany. Assignors to the Farbwerke, vorm. Meister Lucius and Bruning, same place. Process of making sulphur trioxide. Passes a heated gas containing sulphur dioxide and oxygen through a contact substance and cools the product by bringing it in proximity with the incoming sulphur dioxide.

677,703. Ernst Schliemann, Hamburg, Germany. Process of making wax-like bodies by injecting air into a molten mixture of rosin and paraffin.

JULY 9, 1901.

677,853. Prosper Cabrie, New York, N. Y. Artificial stone, of dry sand, slaked lime, plaster of Paris, and powdered alum with yellow and red ochre and lampblack.

677,906. Frank P. Van Denbergh, Buffalo, N. Y. Process of manufacturing alkali silicates. The process of heating sodium chloride and silica in presence of an electric current and oxygen whereby they are fused and the following reaction takes place:

$$4NaCl + SiO_2 + O_2 = Na_4SiO_4 + 2Cl_2.$$

May add some potassium chloride to lower the fusing-point.

678,010. Henry C. McMillin, Clarksburg, West Va. Assignor of one-half to Patrick F. McDonnell, same place. Plastering composition: Calcined plaster, 60; domestic cement, 40; sharp, clean sand, 250; zinc sulphate, 0.125; grape-sugar, 0.5; hair, 0.5; water, 160 parts by weight.

678,070. Hermann Vieth, Ludwigshafen, Germany. Assignor to Knoll and Co., same place. Anthrapurpurin biacetate. A crystalline yellowish powder melting at 175° to 178° C., insoluble in water and dilute acids, nearly insoluble in alcohol, soluble in chloroform or hot acetic acid, gradually decomposed by caustics

Digitized by Google

or carbonated alkalies. Made by treating anthrapurpurin with the calculated quantities of acetylizing reagents adapted to produce a biacetate.

678,154. Max Arndt, Aix-la-Chapelle, Germany. Gas analysis apparatus. The combination of a gas chamber, a receptacle for chemicals below the same and separated by a valve, with devices adapted to lift and expose in said gas chamber a large surface of the chemicals, supply and exit pipes with suitable valves therein, a valve in exit pipe opening to the air, a liquid level indicator and means for closing all the valves in the order named.

678,179. Nelson C. Hodgkins, Augusta, Me. Assignor of one-half to Lewis H. Sanford, same place. Process of recovering sulphurous acid. Reduces the temperature and pressure of the contents of a digester blown off during the cooking process for making sulphite wood pulp, collects the gas from the first part of the process, and repeats the operation during the second part, and adds the reclaimed gas to the body of the liquid previously reclaimed.

678,210. James W. Worsey, St. Helens, England. Assignor of two-thirds to Joseph Henry Lancashire, Streatham, England. Process of treating complex ores. Reduces the combined sulphur of sulphide ores below 15 per cent. by calcination, powders, adds sodium nitrate, boils the mixture in dilute sulphuric acid, roasts the semisolid mass in a closed furnace, dissolves out zinc, copper, and other soluble salts by weak sodium sulphate solution, removes first, the copper, then the zinc and other metals, and finally separates the zinc by lime and sublimes it.

678,215. Max Arndt, Aix-la-Chapelle, Germany. Gas analysis apparatus. A measuring chamber, a tube connecting the top and bottom thereof, an inlet and outlet tube at different levels communicating with an absorption chamber, a part of which contains chemicals, and means for transferring chemicals into the absorption chamber, and means for transferring the contents of the absorption chamber to the measuring chamber and *vice versa*.

678,283. Julius Schafer, Bonn, Germany. Odorless fish powder. Steams fresh fish with their own moisture, cools and dries in vapors of "holzin" to destroy bacteria, then removes fat, glue and mineral matter by alcohol containing acid, finally boils, dries and grinds. Holzin is formaldehyde, 2; menthol, 40; methyl alcohol, 58.

678,323. Moritz Ulrich and Carl Heidenreich, Elberfeld, Germany. Assignors to Farbenfabriken of Elberfeld Co., New York, N. Y. Orange disazo dye. Tetrazotizes *m*-diaminodiphenyl urea, and combines the resulting tetrazo compound with 2 molecules of β-amino-α_3-β_1-sulphonic acid, forming a reddish brown powder readily soluble in water and ammonia yellow-

Digitized by Google

red, in alcohol orange, in sulphuric acid 66° Bé. yellow red, precipitating brown on adding ice, dyeing unmordanted cotton orange that may be further diazotized and developed by β-naphthol on the fiber to a pure bordeaux.

678,330. Ferdinand Blum, Frankfort-on-Main, Germany. Assignor to Pharmaceutisches Institut, Ludwig Wilhelm Gans, same place. Halogen albumen, a slightly yellow amorphous body with 10 per cent. water, freely soluble in water, insoluble in strong alcohol, ether or benzene, precipitated from its aqueous solution by acids in floccula which are difficultly soluble in cold water, insoluble in dilute salt solution, and conglobate when heated. Obtained by halogenizing an albuminous substance in a continuous manner with a nascent halide as fluorine, and neutralizing the intermediate hydrogen halides by an electric current.

JULY 16, 1901.

678,360. Edward Dickson, Swanton, Vt. Assignor to Robin Hood Powder Co., same place. Explosive, containing ammonium picrate, 33.5; potassium picrate, 15.5; barium nitrate, 39.5; flour, 10.75; lampblack, 0.25; potassium ferrocyanide, 0.5 part by weight, granulated and coated with petroleum previously treated with nitric acid, sulphuric acid and ammonia.

678,381. Thomas A. C. Drewett, London, England. Flong for stereo molds. Coats sheets of bibulous unsized paper with a semiliquid mixture of dextrin or gum arabic and alum, then dries and coats with a paste of rye flour, Russian glue, gilders' whiting, borax, starch and black treacle, and dries.

678,391. Henry Froehling, Richmond, Va. Apparatus for extracting nicotine or other alkaloids. A jacketed cylinder has removable covers on each end, to hold the vegetable material, a bottle water trap, a still, and connecting pipes, the still being made of two conical frustrums united by their bases, the lower jacketed whereby the temperature of still and cylinder can be controlled, and a pipe leading from the still through a condenser to the extracting cylinder whereby a continuous circulation of a volatile extracting liquid in a vaporous condition can be maintained through the material.

678,401. Fritz Hofmann, Elberfeld, Germany. Assignor to the Farbenfabriken of Elberfeld Co., New York, N. Y. Salicylic ether of quinine. A tasteless white crystalline powder melting at 138° C. readily soluble in chloroform, hot alcohol and in benzene, difficultly soluble in ether or cold alcohol, the alcoholic solution being colored reddish brown by ferric chloride solution.

678,457. Franklin R. Carpenter, Denver, Colo. Process of treating ores. Fluxes aluminous ores carrying gold and silver with a magnesian flux composed as follows: Silica, 32 to 43 per cent.; lime, 15 to 25 per cent.; magnesia, 5 to 15 per cent.;

Digitized by Google

alumina, 5 to 15 per cent., with other bases up to 100 per cent.

678,500. August H. Lauman, Allegheny, Pa. Process of treating lime. Adds to burnt lime just enough water to make a dry hydrate with constant agitation, and exclusion of air, also under pressure.

678,726. Fritz, R. L. Gehre, Bregenz, Austria-Hungary. Artificial stone, consisting of a chlorine salt, boracite, calc spar, and a filling of paper pulp.

678,732. Charles M. Hall, Niagara Falls, N. Y. Process of purifying bauxite, which consists in fusing the same with a metallic fluoride as fluorspar in less proportion than the material to be treated. Silicon fluoride escapes as a gas.

678,816. Albert J. Shinn, Philadelphia, Pa. Assignor to Herman J. Dercum, trustee, same place. Recovers zinc from a solution of any of its compounds by decomposing the solution by electrolysis, collecting the zinc as amalgam in a stream of mercury flowing over a metal plate, and then passing the amalgam over a surface that separates the thicker pasty portions from the more liquid and the pure mercury which is returned to be reused in the process.

JULY 23, 1901.

678,884. Adolf Kertesz, Frankfort-on-Main, Germany. Assignor to Leopold Cassella & Co., same place. Process of making blue sulphur dye. Takes fibers dyed with sulphur dyes and treats them with air and steam in the presence of alkali at a temperature above 100° C.

678,970. Paul Naef, New York, N. Y. Apparatus for making bleaching-powder. A revoluble cylinder with lime-feeding device at one end and chlorine-supply pipe at the other end, cooling pipes disposed in the cylinder and extending through the end thereof, and communicating with a flue, and means for withdrawing waste gases from the cylinder.

678,973. Stanley C. North, Canandaigua, N. Y. Process of making carburetted air. Produces a flow of carburetted air in a confining chamber in two directions, and directs a flow of oil against the flow of air.

679,158. Leopold Nobis and Augustin Wenzel, Vienna, Austria-Hungary. Process of making elastic concrete material. Adapted for combination with iron, as for lining cellulose boilers. Mixes blast furnace slag, Portland cement and asbestos powder with water and introduces asbestos braids or plaits impregnated with a thin bath of water glass, powdered glass and asbestos powder, and afterwards coated with a thick mixture of the same.

679,172. Paul Julius, Ludwigshafen, Germany. Assignor to Badische Anilin- und Soda-Fabrik, same place. Orange dye,

Digitized by Google

from diazotized primulin sulphonic acid and *p*-nitrophenyl pyrazolone carboxylic acid, nearly insoluble in cold water, on reduction with zinc dust and common salt regenerates primulin sulphonic acid, and capable of developing orange shades on cotton fiber that are scarcely altered by sodium carbonate or dilute hydrochloric acid.

679,199. Julius Abel, Mannheim, Germany. Assignor to Badische Anilin- und Soda-Fabrik, Ludwigshafen, Germany. Blue sulphur dye, from dialkylaminoindophenol thiosulphonic acid heated with sulphur and sodium sulphide, which is insoluble in water, hydrochloric acid or dilute sodium carbonate, and which, on reduction with sodium sulphide solution, is converted into a leuco compound precipitated by hydrochloric acid and insoluble in sodium carbonate solution.

679,202. Maximilian C. L. Althausse, Billwarder an der Bille, Germany. Assignor to Fabrik Chemischer Preparate, von Dr. Richard Sthamer, Hamburg, Germany. Process of making saponin solutions. Boils quillaya bark in water, adds formalin and an acid adapted to form an insoluble precipitate with lime, and filters off the precipitate.

679,203. Maximilian C. L. Althausse, Billwarder an der Bille, Germany. Assignor to Fabrik Chemischer Preparate, von Dr. Richard Sthamer, Hamburg, Germany. Process of obtaining hydrocellulose. Reacts on cellulose with chlorinated glacial acetic acid while heated to a non-oxidizing temperature of 60° to 70° C. with agitation.

679,215. Henry C. Bull, London, England. Assignor of one-half to Arthur Watling, same place. Method of extracting gold from sea-water. Adds to the sea-water milk of lime to form iodide of calcium and liberate the gold from its iodide, settles the sludge, draws off the water, and extracts the gold from the sludge.

679,221. Otto Ernst, Hochst-on-Main, Germany. Assignor to Farbwerke, vorm. Meister Lucius and Bruning, same place. Black polyazo dye, which is a brown powder of slight metallic luster, almost insoluble in alcohol, soluble in water with a dull violet color turned bluer by ammonia, soluble in concentrated sulphuric acid with a gray-green color, on adding water the dye separates as a blue-violet precipitate, it dyes cotton a deep black. Made by adding a chrysoidin from a diazotized aminonaphthol sulphonic acid G and a *m*-diamine, in alkaline solution with a molecule of *p*-diazobenzeneazo-1-6 naphthylamine sulphonic acid.

679,253. Alfred H. Cowles, Cleveland, Ohio. Assignor to the Electric Smelting and Aluminum Co., same place. Process of obtaining volatile elements from their compounds which consists in passing an electric current through a fused mass of such ore or compound to a porous cathode, passing the element as

Digitized by Google

vapor through the cathode and condensing it, the bath being maintained at a temperature higher than the volatilizing point of the metal. Example, sodium.

JULY 30, 1901.

679,305. Max H. Fischer, West Orange, N. J. Baking-powder made of benzoic acid and an alkaline carbonate.

679,330. Elias Peterssohn, Brussels, Belgium. Assignor to the Intractable Ore Treatment Co., Limited, London, England. Process of extracting arsenic, antimony or tellurium from sulphurous ores. Pulverizes and mixes the ore with carbonaceous material, forms it into blocks, heats them under exclusion of air to the volatilizing point of arsenic, then heats to a temperature sufficient to separate the other components but not sufficient to reduce remaining sulphides, and condenses and collects the products.

679,388. Johann F. W. Meyer, Scheune near Stettin, Germany. Chemical apparatus for measuring fluids, the combination of a measuring tube, a vessel with neck opening in the lower part thereof, having a valve at its lower end, pipes connecting said valve and vessel, a bulb on the upper end of the tube with pipes connecting the bulb and vessel so arranged that any overflow from tube is forced back into the vessel.

670,404. Auguste V. L. Verneuil, Alexander L. Godefroy Lebeuf, and Albert L. Arnaud, Paris, France. Extracting India-rubber by crushing the material containing rubber in water so finely as that the ligneous portions are carried off by the water and causing the crude rubber to agglomerate, then treating it with hot water to eliminate remaining matters.

679,508. Heinrich Linnekogel, Stuttgart, Germany. Method of treating ramie fiber. Mixes dried ramie fiber, 100; soap, 10; sodium carbonate, 20; glycerol, 10; and pumice, 1; adds sufficient soft water and boils for twelve to sixteen hours, then draws the fiber through a 5 per cent. soap solution and finally through a 5 per cent. solution of sulphuric acid. W. H. SEAMAN.

Digitized by Google

REVIEW OF AMERICAN CHEMICAL RESEARCH.

VOL. VIII. No. 4.

WILLIAM A. NOYES, Editor.

REVIEWERS:

M. T. Bogert, Benton Dales, W. F. Hillebrand, A. A. Noyes, W. H. Seaman, E. M. Chamot, L. M. Dennis, L. P. Kinnicutt, H. N. McCoy, J. W. Richards, J. O. Schlotterbeck, B. S. Cushman, A. H. Gill, H. W. Lawson, S. P. Sadtler, F. P. Underhill.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

TWENTY-FIRST ANN. REP. U. S. GEOL. SURVEY, PART II.

Geology of the Rico Mountains, Colorado. BY WHITMAN CROSS AND ARTHUR COE SPENCER. pp. 7–165.—The igneous intrusions of this region consist of intrusive sheets of quartz-bearing hornblendic monzonite-porphyry, of stocks and dikes. The stocks are of typical monzonite, appearing like diorite at first sight. The presence of a small amount of quartz brings this monzonite into close relation with the quartz-diorites and the quartz-bearing syenites. Two types of dike rocks are found: the one a pronounced porphyry characterized by large orthoclase crystals, the other a dark, dense, aphanitic rock occurring in dikes of no great extent or thickness, and probably of younger age than any of the other intrusives. The rocks of this last type have been named olivine-bearing augite vogesites, and have a theoretical interest as products of magmatic differentiation from the monzonite magma. Few of them are fresh enough to allow of ascertaining their normal composition. Contact action between the monzonite stock and adjacent calcareous strata has been pronounced and is of the character usually associated with the presence of such agents as chlorine, fluorine, and heated water. No evidences of external volcanic activity are discoverable, but solfataric action is not lacking, as shown by the formation of alunite and the existence of numerous exhalations and springs of hydrogen sulphide and carbonic acid. Republished analyses of four monzonites from other stocks of southwestern Colorado by Stokes, Eakins, and the reviewer are given, with two of classic foreign occurrences for comparison; also of three monzonite porphyries by the reviewer from La Plata, Henry and Carriso mountains, very similar to the Rico rocks so far as the feldspars go, but showing vari-

Digitized by Google

ations in the amounts of other minerals. Two original analyses by Steiger are quoted of nearly pure alunite rock from Calico Peak in the Rico district, showing a far greater conversion of the porphyry than in the Rosita Hills, Custer Co., Colo. No diaspore, however, has been noted in connection with the Rico alunite.

The Esmeralda Formation, a Fresh Water Lake Deposit in Nevada. By H. W. Turner. pp. 191–226.—The deposits of this formation are near the California line in the Silver Peak Quadrangle, in Western Nevada. At one place is found a bed of calcareous tufa, closely resembling the thinolite from Lake Lahontan. Professor Dana, to whom a specimen was sent, "suggests that the original material may have been crystallized aragonite, which has gone over to calcite by paramorphosis, regarding this as a more probable origin than that which he formerly suggested, that thinolite is a pseudomorph after a double salt of calcium and sodium." An analysis of a lignite containing 28.8 per cent. of ash, and 1.05 per cent. of sulphur, the chief material of economic importance of the lake beds, is given. Sublimation deposits of sulphur occur at one place.

Mineral Vein Formation at Boulder Hot Springs, Montana. By Walter Harvey Weed. pp. 227–255.—Situated in a granite region, about midway between Butte and Helena, these are among the very few hot springs which are clearly depositing ore, though in this case the deposits have no economic importance. Gold, silver, and copper do occur, however, in the larger deposits of quartz, *stilbite*, and calcite and, furthermore, there is going on a "metasomatic replacement of granite by the hot waters, forming the zone of replaced rock which is so common a feature of the quartz veins of the region, and in which the workable ores of the veins of the region commonly occur." No surface deposit of moment is now forming anywhere. The temperature of the springs is from 120° F. to 160° F. At the springs the water has a faint odor of hydrogen sulphide, but is clear and tasteless. No reliance is to be placed on the analysis of unknown origin published in the report, for it shows its character on its face, but the nature of the water may be, to a certain extent, judged by the composition of an efflorescence found on a tunnel wall: soluble in water, 88.27; $CaCO_3$, 5.72; SiO_2, etc., 6.01; the soluble portion consisted of Na_2SO_4, 47.25; Na_2CO_3, 28.33; NaCl, 1.09; CO_2 in excess of normal carbonate, 1.96; SiO_2, 0.25; difference (mainly H_2O), 9.39. The width of the vein filling is variable, in general, not exceeding 2 to 3 feet. The deposit, though often showing calcite, is not of the normal hot springs type, but in general "is hard, and consists of a white or dark gray substance, intermixed with more or less red jaspery material in bands and patches, sometimes carrying included fragments of slightly altered granite, but in large part consisting of a white crystalline substance which is

Digitized by Google

found to be a mixture of chalcedony and stilbite." The metasomatic alteration of the granite consists chiefly in the development of sericite and kaolinite without calcite, replacing both quartz and feldspar.

Geology of the Eastern Choctaw Coal Field, Indian Territory. By JOSEPH A. TAFF AND GEORGE I. ADAMS. pp. 257–311. — Seven workable beds are known, occurring in four different formations from the top of the Hartshorne sandstone upward to the lower part of the Boggy shale. Ten proximate analyses by Steiger are given, as also for comparison, seven of coals from the McAlester-Lehigh or Western Choctaw field, reproduced from an earlier report (see Abstract **23**, 91). Classified according to fuel ratios these coals may be considered bituminous, with one exception which verges on semibituminous, since the fuel ratios with this exception do not exceed 5.00. In all but two cases moisture is far below 1 per cent.; phosphorus ranges from 0.012 to 0.140 ; sulphur from 0.69 to 5.81 ; ash from 4.63 to 13.31.

Preliminary Report on the Camden Coal Field of Southwestern Arkansas. By JOSEPH A. TAFF. pp. 313–329.—Three analyses by Steiger of the coals from this field show in the coal fresh from the mine a very high content of water (33–38 per cent.), of which from 23 to 27.5 per cent. is given up to dry air, and 9.8 to 11.2 per cent. is regained in moist air after 154 hours. In the fresh coal sulphur does not exceed 0.5 per cent. A test made in Pittsburg to show the gas-producing quality of the coal gave 11,386 cubic feet of gas of 22.3 candle-power per ton of coal. By a comparative table it is shown " that the Camden lignite is superior, both in yield and in candle-power of gas, to the standard bituminous coals of Pennsylvania and England, and that as a gas producer it is inferior only to the best cannel coals."

A Reconnaissance from Pyramid Harbor to Eagle City, Alaska, Including a Description of the Copper Deposits of the Upper White and Tanana Rivers. By ALFRED HULSE BROOKS. pp. 331–391.—Copper deposits were found and briefly examined at Rainy Hollow, where the minerals are bornite, chalcopyrite, and malachite, and about Kletsan Creek and between the Tanana and Nabesna Rivers. In these latter cases the ore is chiefly native copper in placers. At Kletsan Creek native copper was found in veins of calcite following joints in dioritic greenstone, while in the Tanana-Nabesna region chalcopyrite without native copper was found in amygdaloidal greenstones. The conclusion is reached that the deposits may be of more than superficial character and that the upper regions are worthy of careful investigation. It is believed also that the Por-

Digitized by Google

cupine and Forty-mile gold districts may have an important future.

A Reconnaissance of the Chitina River and the Skolai Mountains, Alaska, in 1899. By Oscar Rohn. pp. 393–440. —With respect to copper, it is concluded "that while the existence of workable deposits has not been shown by actual exploitation, the information resulting from the year's work shows the area to be mineralized and to be favorable to mineral concentration,—an area, therefore, that warrants a detailed economic survey."

Preliminary Report on a Reconnaissance Along the Chandlar and Koyukuk Rivers, Alaska, in 1889. By Frank Charles Schrader. pp. 441–486.—The sections on geology and mineral resources offer little of interest to the chemist. In the Nulato sandstone on the Yukon a lignitic coal is mined at several points above Nulato, which seems to be a good steaming coal, comparing favorably with those of the Indian Territory and other regions of the Western States.

W. F. Hillebrand.

TWENTY-FIRST ANN. REP. U. S. GEOL. SURVEY, PART III.

The Newark System of the Pomperaug Valley, Connecticut. By Wm. Herbert Hobbs. pp. 7–162.—Among the petrographical data of Chapter III are two analyses by the reviewer of basalts from the region, one from the anterior basalt sheet near Pine Hill, South Britain, the other from the main extrusive sheet near the summit of Pine Hill. Several other analyses, both single and composite, taken from other sources, show the relation of the basalts of the Pomperaug Valley to those of other areas of the Newark system. The first of the two described is an olivine-basalt, always found in weathered condition owing to limited thickness and vesicular state. Of the second or main basalt two "types are recognized in the field—the dense black rock of the lower zone found chiefly in the western ridges, and the more open-textured and weathered type of the upper zone, found in the eastern areas and in occasional exposures in the northwestern portion of the region." The microscope shows additional distinctions. It is shown that the anterior or olivine-basalt probably differs from that of the main flow in its original composition and to some extent in its structure as well. The feldspar of the former is a basic oligoclase or an acid andesine, while labradorite characterizes the latter. Serpentinized olivine is nearly or quite absent from the main sheet while common in the older.

The Laccoliths of the Black Hills. By Thomas Augustus Jaggar, Jr.; **with a Chapter on Experiments Illustrating Intrusion and Erosion.** By Ernest Howe. pp. 163–304.—

Digitized by Google

This elaborate and interesting study of the structure and origin of intrusions is devoid of chemical matter.

The Iron Ore Deposits of the Lake Superior Region. By C. R. VAN HISE. pp. 305–434.—It is impossible to here present an adequate abstract of this important general statement as to the stratigraphical positions and origin of the iron-bearing formations of the six iron-bearing districts of the Lake Superior region south of the international boundary, and summary of the principles controlling the deposition of the ores. Suffice it to present portions of the author's summary of the genesis of the ores. Cherty iron carbonate is the main original rock, though in the Mesabi district ferrous silicate, resembling glauconite in appearance, is also very important. "The rocks are metamorphosed along two main lines. The first of these produces amphibolitic and magnetitic quartz rocks or schists, and occasionally also pyroxenitic and chrysolitic rocks. These rocks develop under deep-seated conditions in connection with igneous intrusives, and especially the basal gabbro intrusives of the Keweenawan. Where the iron-bearing formations have thus been altered no workable ore bodies have as yet been found. The second line produces ferruginous slates, ferruginous cherts, jaspilites, and ore bodies. These rocks develop mainly in the belt of weathering, although in many cases the production of the jaspers requires two stages—first, the formation of the ferruginous slates and ferruginous cherts in the belt of weathering, and later dehydration when the formations were deeply buried." Initial steps in the formation of ore bodies were the formation of detrital ferruginous sandstone and conglomerate, also the oxidation of iron carbonate in place. "But all of the facts irresistibly lead to the conclusion that the final and most important step in the production of the ore bodies was secondary enrichment by downward-percolating waters below crests or slopes where such waters were converged by the pitching troughs. The waters which followed the more circuitous routes transported iron carbonate ; waters more directly from the surface, which did not pass through iron carbonate, bore oxygen ; the two kinds of solutions mingled and precipitated iron oxide. The waters ascended and escaped below the valleys. Finally, the great quantity of water which was converged in these troughs and moved downward abstracted the silica and carried it elsewhere."

In spite of the enormous quantities of ore yet available, the author gives timely warning that "the exhaustion within a few decades of the high-grade ores of the Lake Superior region *now discovered* is little short of a certainty," and that the mines should be developed and exploited now with a view to the future utilization of the ores of lower grade.

Digitized by Google

The Arkansas Bauxite Deposits. By Charles Willard Hayes. pp. 435–472.—Because of the near exhaustion of the Georgia-Alabama deposits those of Arkansas, south and southwest of Little Rock, are being exploited and worked. Their mode of occurrence being totally unlike those of Georgia, a different origin must be ascribed to them. In the larger or Bryant district the beds are underlain by a syenite, but are separated from it there and probably elsewhere by a thick layer of kaolin derived from the syenite. It is not known whether the bauxite was laid down originally on fresh syenite or on already formed kaolin. There is nothing to show that the kaolin is an intermediate product between the syenite and bauxite. The latter follows evenly the undulations of the syenite to considerable distances laterally. There are two types of it in the district—a granitic one directly upon the kaolin, consisting of boulders still showing granitic structure and evidently derived from metasomatic alteration of boulders or ledges of the syenite—and above this a pisolitic type like that of Georgia and as evidently a product of chemical precipitation. For reasons given the author accepts in their entirety neither of the theories advanced by J. F. Williams, but tentatively puts forth the following as far from satisfactory, but as best meeting a large number of conditions and facts that must be taken account of. "The syenite of the bauxite region was intruded under a light cover of paleozoic rocks. These were subjected to rapid erosion and the surface of the syenite was exposed. Either its subjacent portions retained a considerable portion of their original heat, or a fresh supply of heat was furnished by renewed intrusions or dynamic disturbances. The region was then covered by a body of water probably cut off from the sea, and salt or highly alkaline. The alkaline waters by some means gained access to the heated portions of the syenite and dissolved its minerals. The heated waters returned to the surface heavily charged with the constituents of the syenite in solution. They were still efficient solvents, however, and acted upon the syenite at the surface, removing most of the silica along with the lime and alkalies, but leaving the alumina and depositing in place of the constituents removed about as much more alumina as the rock originally contained. Some of the alumina brought to the surface in solution was thus deposited by this metasomatic process, replacing a part of the silica removed from the syenite, but a larger part was thrown down as a gelatinous precipitate on the bottom of the water body, and somewhat evenly distributed over the underlying syenite surface, at the same time acquiring the pisolitic structure and becoming mingled with the boulders of aluminized syenite." The formation of the bauxite beds marks a single exceptional episode, abruptly inaugurated and as abruptly terminated. Commercial analysis of the granitic bauxite, of 2.7 sp. gr., shows it to contain Al_2O_3, 63.00 ; SiO_2, 2.25 ; Fe_2O_3, 1.95;

Digitized by Google

H_2O, 31.50–32.75. This composition conforms to that of gibbsite ($Al_2O_3.3H_2O$) much more closely than to that of bauxite ($Al_2O_3.2H_2O$), a conclusion reached also by Watson (abst. this Journal, **24**, 120), for the Georgia bauxites. The beds are extensive and will afford many millions of tons of bauxite, as shown by a table of estimates.

Tennessee White Phosphate. By CHARLES WILLARD HAYES. pp. 473–485.—The author's earlier views as to the formation of the lamellar white variety of the Tennessee phosphates in Perry County have been confirmed by later investigations on more extended exposures. The phosphate was deposited in a rather uniform layer on the floors of extensive limestone caverns, also "in less regular cavities in a limestone above the stratum in which the main cavern formed. When this limestone was dissolved these masses settled down with the residual clay in which they are now embedded." . . "The phosphate was doubtless deposited in these caverns from quiet water. . ." Of the three varieties of phosphate in the district—stony, lamellar, and breccia—the lamellar appears to be not only of the best grade but also most abundant. At one of the largest workings there seems to be no difficulty in getting a product that runs from 79 to 81 per cent. calcium phosphate.

Report on the Geology of the Philippine Islands. By GEO. F. BECKER. pp. 487–625. This report includes little new matter because the conditions during the author's stay of fourteen months seldom permitted even limited geological exploration. But in it is collected "so far as is practicable all that is known of the geology of the Philippine Islands. The report is intended as a *vade mecum* for geologists in the field and a guide to the literature in the office." W. F. HILLEBRAND.

Preliminary Description of the Geology and Water Resources of the Black Hills and Adjoining Regions in South Dakota and Wyoming. By NELSON HORATIO DARTON. *U. S. Geol. Survey, 21st Ann. Rep., Part IV*, pp. 489–599.—Analyses by Steiger of Minnekahta dolomite, of volcanic ash from near Argyle, S. D., of gypsum from south of Hot Springs, S. D., and of brine from Salt Springs at head of Salt Creek, appear in this report. Railroad companies have furnished analyses of artesian water from Argentine, S. D., and Jerome, Wyo., and of a water highly charged with calcium sulphate and calcium and magnesium carbonates from Cascade Creek, S. D. There are also six reproduced analyses of fuller's earth from South Dakota. The mineral resources of the region receive some attention. W. F. HILLEBRAND.

The High Plains and Their Utilization. By WILLARD D. JOHNSON. *U. S. Geol. Survey, 21st Ann. Rep., Part IV*, pp. 601–741.—In this thoughtful and important treatise there is little

Digitized by Google

chemical matter, though the cause of cementation by calcium carbonate receives consideration, both the feeble cementing of silts, sands, and gravels and that known by the name "mortar beds," so-called because of their hardness and resistant character.

W. F. HILLEBRAND.

The Asphalt and Bituminous Rock Deposits of the United States. BY GEORGE H. ELDRIDGE. *U. S. Geol. Survey, 22nd Ann. Rep., Part I*, pp. 209–452.—In this general and comparative review there is "no attempt to discuss the many varieties of material from a chemical standpoint, nor their merits for paving and other uses," though references to these points are made, and a table of heterogeneous proximate and ultimate determinations of 49 samples of type material by many different analysts is given, followed by five analyses of certain European asphalt rocks. "The origin of the hydrocarbons as such and in the bituminous compounds discussed," is ascribed to petroleum. To the former members of the asphaltite group—albertite, grahamite, uintaite (gilsonite)—two new names are added, impsonite and nigrite. *Impsonite*, named from Impson Valley, in Indian Territory, is jet-black, bright, hackly to brittle in fracture, of crushed structure, and 1.175 sp. gr. It does not melt, but in a retort softens and decomposes simultaneously, like coal; in a tube it softens without melting; cokes. Does not soften in boiling water. In candle flame shows incipient fusion and takes fire, burning for a short time after removing from flame. In turpentine almost insoluble; carbon disulphide dissolves over 35 per cent., ether 5.34 per cent., alcohol a trace. *Nigrite*, found near Soldiers Summit, in Utah, is jet-black with similar streak, brilliant, has conchoidal to cuboidal fracture and cuboidal to massive structure. It is less fusible than uintaite and melts only on liberal fluxing with oil or gum. Its solubility in reagents is unknown except heavy oils, fats, and lubricating petroleum, in which it is soluble if powdered, especially if to the oil be added resin and the whole heated.

W. F. HILLEBRAND.

The Gold Belt of the Blue Mountains of Oregon. BY WALDEMAR LINDGREN. *U. S. Geol. Survey, 22nd Ann. Rep., Part II*, pp. 551–776.—An adequate review of this thorough though necessarily far from exhaustive paper on the most important gold-bearing area of Oregon, in the northeastern part of the state, is quite impossible in the space at command. Statistics of production, geology, mineral deposits, and detailed descriptions of mining districts occupy separate chapters. A partial analysis of an unusually pure albite-granite from Sparta, and a complete one of of a normal granodiorite from Bald Mountain containing a little more quartz than is usual in the granodiorites of the Sierre Nevada, both by the reviewer, form the only quantitative analytical matter of the report, except an analysis said to represent the com-

Digitized by Google

position of the thermal Medical Springs water, 20 miles north-northeast of Baker City. Among the 51 minerals thus far found in the Blue mountains, mercurial tetrahedrite, roscoelite, and a probably new mineral near calciovolborthite, but containing some sodium, may be mentioned. W. F. HILLEBRAND.

Notes on a Geological Reconnaissance in Eastern Valencia County, New Mexico. BY D. WILSON JOHNSON. *Am. Geologist*, **29**, 80–87. This is an account of a region to the southeast of Albuquerque, abounding in salt and alkali basins. The sodium chloride contents are given for samples of water, adjacent earth and underlying clays, incrustations and deposits.
W. F. HILLEBRAND.

Sacred Heart "Geyser Spring." BY CHARLES P. BERKEY. *Am. Geologist*, **29**, 87–88.—The water of this spring in Renville County, Minnesota, has local medicinal repute. An analysis made for the owner (chemist not named) shows it to contain 115 parts of total solids per 100,000, composed chiefly of magnesium and calcium bicarbonates and calcium sulphate.
W. F. HILLEBRAND.

Oil and Gas Fields of the Western Interior and Northern Texas Coal Measures, and of the Upper Cretaceous and Tertiary of the Western Gulf Coast. BY GEORGE I. ADAMS. *U. S. Geol. Survey, Bull. No. 184.* 64 pp.—This latest authoritative contribution to a subject of great public interest is devoid of original chemical data. W. F. HILLEBRAND.

A New Occurrence of Sperrylite. BY H. L. WELLS AND S. L. PENFIELD. *Am. J. Sci.*, 13, 95–96.—Platinum has been reported of late in the copper ores of the Rambler mine, about 50 miles southwest of Laramie, Wyoming. The authors, by alternate treatment of covellite ore with strong boiling nitric acid and caustic soda solution, obtained a concentrate from which a few glittering, highly modified crystals were isolated, weighing approximately 0.00004 gram. These fused on heating, gave a sublimate of crystalline arsenious oxide, and the residue when dissolved in aqua regia gave, on evaporation with ammonium chloride, yellow octahedral crystals of ammonium platinic chloride. The crystals were doubtless sperrylite, $PtAs_2$, but the authors do not assert that platinum may not occur in some other form in the ore. Professor Wilbur C. Knight has published reports showing that the Rambler ore is generally platiniferous, running from 0.06 oz. to 1.4 oz. per ton (0.0002 to 0.0048 per cent.), and that it may prove of commercial importance. The authors express the hope that copper ores will hereafter be carefully examined for platinum, since the occurrences of sperrylite seem to show its association chiefly with ores of copper. W. F. HILLEBRAND.

Digitized by Google

The Composition of Yttrialite with a Criticism of the Formula Assigned to Thalenite. By W. F. HILLEBRAND. *Am. J. Sci.*, **13**, 145–152.—The empirical formula $R_2'''Si_2O_7$ of Hidden and Mackintosh for yttrialite is confirmed and it is shown that the basic formula of Benedicks $Fe''Y_4Si_4O_{15}$ (*Bull. Geol. Inst. Upsala*, **4**, 1, 1898) has no standing. The formula of H. and M. is not, however, susceptible of representation as a simple salt of the acid $H_8Si_8O_{28}$. On the purely hypothetical assumption of admixture of anhydrous thorite, the remaining constituents afford ratios conforming quite closely to those of a basic metasilicate $R''R'''_3(R'''O)'_3(SiO_3)_7$. It is shown that the formula proposed by Benedicks for thalénite, $H_2Y_4Si_4O_{15}$, is to be regarded as doubtful. W. F. HILLEBRAND.

Relations Between the Geology of Petroleum and Its Origin. By HENRI NEUBERGER. *Sci. American Suppl.*, No. 1362, p. 21,823.—In view of known facts with regard to the occurrence of petroleum exclusively in sedimentary formations and of Engler's well-known experiments, the author adopts with confidence in this Summary of Communication to the Petroleum Congress the theory of the geologists "that formations rich in marine fossils are alone producers of petroleum, and that all may be such. . . . . The lands richest in petroleum, the lands not only impregnated, but producers, would be theoretically the marine sediments the richest in elements of non-fibrous organic decomposition." W. F. HILLEBRAND.

The Mineral Springs of Austria. *J. Soc. Arts through Sci. American Suppl.*, No. 1362, p. 21,828.—Contains brief statements of the character and uses of the waters of many of the springs of this empire. W. F. HILLEBRAND.

METALLURGICAL CHEMISTRY.

Germany's Mining and Metallurgical Industries. By H. L. GIESEL. *Min. and Met.*, December 1, 1901.—The output of the principal mining industries of Germany, for 1900, was:

	Tons.	Value.
Bituminous coal	109,271,726	$241,498,250
Lignite	40,279,332	24,436,500
Iron ore	18,964,367	19,407,000
Potassium salts	2,475,170	7,250,000
Zinc ore	639,215	6,438,250
Lead ore	148,230	4,516,000
Copper ore	747,775	5,956,000
Silver and gold ore	12,507	514,500

The great coal-mining regions are the Rhenish-Westphalian, the Silesian, and the Saar. By-product coke ovens are mostly of the Otto system. The Brunck system is extensively used in treating the by-products. Iron ore is produced chiefly in Luxem-

Digitized by Google

bourg, Alsace-Lorraine, and in the Bonn district. Large quantities of Swedish and Spanish ores are imported. Zinc ore is mined principally in the Oppeln district, Silesia, followed by the Bonn and Clausthal districts. Lead ore is mined in the districts of Bonn, Breslau, Clausthal, and Dartmund. Copper ore occurs principally near Merseburg. Germany now practically controls the potassium salt markets of the world. The potassium and magnesium salt beds were first discovered in 1843. The mines are all equipped with the most modern machinery, electricity is almost universally used for transportation, lighting, and drilling. At least $75,000,000 is invested in this industry. Regarding pig iron, the Rhenish provinces and Westphalia produce 40 per cent. of the total, which was nearly 8½ million tons in 1900. Germans are preeminent in Europe in mechanical ability, and in appreciation of modern machinery and appliances.

J. W. RICHARDS.

A New Blast-Furnace Record. *Eng. and Min. J.*, December 7, 1901.—The Carrie Furnace, No. 3, of the Carnegie Steel Co., at Rankin, Pa., has made 790 tons of basic iron in twenty-four hours. A total of 2,270 tons of material went into the furnace, and 1,871 pounds of coke were used per ton of iron made. The furnace works on non-Bessemer ores carrying 52 to 58 per cent. of iron; it is 100 feet high, 23 feet in diameter at the bosh, has 12 tuyères, and was worked at an average blast-pressure of 21 pounds per square inch, during this record run.

J. W. RICHARDS.

Early History of Open-Hearth Steel Manufacture in the United States. BY S. T. WELLMAN. *Eng. News*, December 12, 1901.—Cooper, Hewitt, and Co., of Trenton, N. J., purchased the Siemens-Martin patent rights in America, and built a furnace of 5-ton capacity, in 1868. Good silica brick were lacking, and after running at intervals for a year or two it was abandoned as a commercial failure. The Bay State Iron Works, at South Boston, was the second to try the work, and carried it out successfully, under the superintendence of Ralph Crooker, in 1870. Ferromanganese was largely the means of success in this furnace, as its absence had largely contributed to the failure of the Trenton furnace. This furnace was of 5-ton capacity, and was run day and night for many years. The Nashua Iron Co., at Nashua, N. H., next built another 5-ton furnace; Singer, Nimich, and Co., of Pittsburg, followed them closely. The Ohio Iron and Steel Co., of Cleveland, was the first plant put up in the United States, exclusively for open-hearth steel manufacture. It started in 1874, with two 7-ton furnaces, with a raised charging platform, a plan still followed by the latest and best works. The first basic open-hearth steel made in the United States was made at the Otis works, in 1886, followed some months later by the

Digitized by Google

Pennsylvania Steel Co., at Harrisburg, and the Carnegie Steel Co., at Homestead. At least three-fourths of American furnaces are now basic-lined. The latter works alone have forty-eight 40- to 50-ton basic furnaces; furnaces of 100-tons capacity are being built. J. W. RICHARDS.

Charles E. Smith, a Pioneer of the American Iron Industry. *J. Franklin Inst.*, October, 1901.—Born in Philadelphia, in 1820, Mr. Smith commenced practical life on a railroad corps, at 18 years of age. He then had supervision of the Blossburg Coal Mines, and at 26 built the Fairmount Rolling Mill, at Philadelphi. For sixteen years, from 1845 to 1861, he was intimately connected with the development of the iron business, his contemporaries being Abram S. Hewitt, John Fritz, Coleman Sellers, James Moore, and Washington L. Jones. He was one of the first in this country to improve rolling, to introduce the Nasmyth steam hammer, to make rails, to use the hot saw, to try the automatic puddler. He assisted the iron business very much by his connection with the "American Iron Association," particularly in its memorials to Congress. From 1861 to 1869 he was president of the Reading Railroad, being a railroad manager of the first rank. J. W. RICHARDS.

Iron in New South Wales. BY JOHN PLUMMER. *Eng. and Min. J.*, December 28, 1901.—No iron is at present manufactured in this province, but promising ores, with limestone and coal beds, are found within its borders, and its manufacture is one of the possibilities of the near future. J. W. RICHARDS.

Compressing Steel. *Eng. and Min. J.*, December 28, 1901.—In a process introduced by Beutter at St. Etienne, France, pressure is applied to the ingot from below, forcing the ingot into the taper of the mold, thus bringing lateral pressure to bear on the interior. The scrap is reduced to 4 per cent., porosity is prevented and the mechanical properties are much improved.
J. W. RICHARDS.

The Manganese Deposits of Gandarella, Minas Geraes, Brazil. BY J. G. MICHAELI. *Eng. and Min. J.*, December 21, 1901.—Gandarella is known for its quarries of fine colored marbles, its immense beds of manganiferous iron ores, and its tertiary lignite basin. Some of the pyrolusite beds are 65 feet wide. Analyses show 79 to 93 per cent. of manganese dioxide, with sulphur nothing or traces, and phosphorus in traces.
J. W. RICHARDS.

A Wet Crushing Cyanide Plant at Ely, Nevada. BY SPECIAL CONTRIBUTOR. *Eng. and Min. J.*, December 7, 1901.—The mill described is on the property of the Chainman Mining and Electric Co. The process is cyaniding after wet crushing and amalgamation. The ore is low grade, a single treatment with cyanide

Digitized by Google

extracts only 75 per cent. of the gold content. Amalgamation alone extracts 25 to 40 per cent., depending on the class of ore. About 1 ton of concentrates are obtained per 100 tons of ore, carrying $100 in precious metal, with most of the lead of the ore. To meet these conditions a mill was designed by F. D. Smith and A. B. Browne, the milling operations being as follows: (1) screening and crushing; (2) amalgamation; (3) concentration; (4) sizing and settling; (5) leaching; (6) precipitating; (7) treatment of slimes; (8) refining and assaying. The crushing is done by Austin crushers and Trent Chilian mills; capacity 300 tons per day. Amalgamation is performed by silver copper plates 4 feet by 9 feet, four of which are used to each Chilian mill. With $9 ore, about $2.50 is saved on the plates. A 50 H. P. Westinghouse motor runs this machinery. Concentration is done on eight Cammett tables. The 2 to 8 ounces of silver in the ore, with the lead occurring mostly as carbonate, goes with the gold into the concentrates. The ore thence goes into settling tanks, from which the slimes pass away, while the main body of ore is drained and dried by vacuum pumps, and taken to the leaching tanks. The tanks are 26 feet square by 5 feet deep, of $^{3}/_{16}$-inch steel, and four of them are in a room 185 by 30 feet. Six similar tanks are provided for cyaniding. A ninety-six hour leach is sufficient. The precipitation room is 60 by 32 feet, and is equipped for zinc dust precipitation in two tanks of 10 feet diameter by 5 feet deep. The slimes plant has to treat 35 per cent. of all the ore crushed. Practically 98 per cent. of this is said to be caught in V-shaped boxes of special design, not described, whence the slimes pass to agitating tanks where they are treated with cyanide solution, and after treatment passed through a filter-press, and the solution afterwards precipitated. In the refinery the gold precipitate is treated with sulphuric acid, then passed through a lead-lined filter-press to separate the gold powder. Electric power to run the mill is generated at Ely, two miles distant, where there is 180 feet head of water running a Pelton water-wheel, and furnishing also light to the town. J. W. RICHARDS.

The Mines of Toponah Lake, Nevada. BY SPECIAL CORRESPONDENT. *Eng. and Min. J.*, December 14, 1901.—A vigorous camp in an arid region; is now producing 400 tons of ore a day, only the richest of which can be transported to the smelters, but many thousands of tons of second-class ores averaging $60 per ton is being piled up, awaiting cheaper transportation. It costs now about $45 per ton for mining, handling, freight, and treatment charges at the smelter at Everett, Wash. The main deposit, the Mizpah ledge, has been proven for 1300 feet and $4^{1}/_{2}$ feet wide. The ore taken from the main shafts in the ledge runs as high as $700 per ton. The correspondent styles this camp as one of the greatest discoveries of late years in Nevada.

J. W. RICHARDS.

Digitized by Google

The Future of the Witwatersrand Gold Field. By J. Hays Hammond. *Eng. News*, December 19, 1901. Paper read before *Am. Inst. Mining Eng.*—The Rand is exceptional in the reliability of its ore-bearing formation. The conditions are most favorable for mining at great depth; excessive water is not to be apprehended and the increment of temperature is abnormally low—one degree Fahrenheit to 212 feet in depth. The auriferous area probably contains, to a depth of 6,000 feet for a distance of 10 miles along the central section, 600,000,000 pounds sterling worth of gold. The east and west sections contain probably one-third as much. This would assure an annual output of twenty millions sterling for forty years. J. W. Richards.

Mining Conditions in the Transvaal. By Special Correspondent. *Eng. and Min. J.*, December 21, 1901.—The great problem is scarcity of native labor; the larger mines have kept their workings free from water at great expense, during the war, and are now starting up as they can get hands. Rock drill men are scarce and very well paid. The long article gives a realistic account of the economic conditions. J. W. Richards.

The Gold-Dredging Fields of Eastern Russia. By C. W. Purington and J. B. Landfield, Jr. *Eng. Mag.*, December, 1901.—Gold-dredging is at present most successful in New Zealand and Australia. Attempts in Alaska, British Columbia, and South America have not been very successful. In the United States, dredging operations are most successful in California. The conditions for successful dredging are that the gravels must be shallow, not more than 40 feet deep; broad valleys must therefore be sought, rather than narrow gorges; bed rock must be of a soft character to admit of scraping off superficial gold from it. Old valleys are better than new ones, since the size of boulders in them is less, and they contain more gold. Such valleys are the rule in eastern Russia and western Siberia; crescent-shaped lagoons frequently occur far away from the present rivers, representing former channels, precisely analogous to the Mississippi "cut-offs." The gravels are shallow, and underlaid by a floor of decayed slates and schists. During 1900, a New Zealand dredge was put into operation in the Mariïnsk district, with complete success. Gold is found to average twenty cents per cubic yard of gravel; the cost of handling is about six cents; a working season of six months can be relied upon, and labor is abundant and cheap. J. W. Richards.

The Russian Law of Gold Mining. By C. W. Purington and J. B. Landfield, Jr. *Eng. Mag.*, January, 1902.—Quotes thirty sections of the statutes bearing on this industry. There is no real difficulty in complying with all the numerous regulations, the miner receiving in return a protection which renders him

Digitized by Google

secure from the dangers of litigation. The expenses of locating and patenting claims are small, not over $125 including all field and camp expenses. The right of the operator to hold the ground ceases when he has exhausted its mineral resources. All gold extracted must be sold to the government. J. W. RICHARDS.

Discovery of Platinum in Wyoming. BY W. C. KNIGHT. *Eng. and Min. J.*, December 28, 1901.—The Rambler Mining Co. has had trouble with its assays for silver, and on attempting to find the cause of the trouble it was found to be due to platinum in the ore in paying quantities. It occurs more largely in the blue copper carbonate. The mine is 50 miles southwest of Laramie, in the Medecine Bow Mountains, at 9,000 feet elevation. The ore averages 30 per cent. of copper by the carload. At 70 feet the vein is oxidized ore, with sulphides lower down, and occurs in schistose formation. It is not known yet whether the platinum occurs metallic or as a compound. Assays by H. E. Woods, of Denver, on large quantities of ore show platinum in ounces per ton as follows: cuprite, 0.18; bornite, 0.18; chalcocite, 0.15; covellite, 0.40; chalcocite, 0.60; azurite, 0.70. Assays of car-load lots have shown as much as 1.40 ounces of platinum per ton, with an average of 0.80 ounce. The matte has contained 1.92 ounces. The gold in the ore averages 0.03 to 0.05 ounce, but the platinum has been missed by reason of its dissolving in the nitric acid with the silver, which latter runs 3 to 10 ounces. J. W. RICHARDS.

Assay of Zinc Precipitates. BY C. H. FULTON AND CH. H. CRAWFORD. *Eng. and Min. J.*, December 21, 1901. From *School of Mines Quarterly*, January, 1901.—Scorification gives low results, caused by volatilization and loss in slags. The crucible method gives high results for gold, but not on silver. The best charge for the crucible method is Magenau's, *viz.*, 0.1 A. T. precipitates, 70 grams litharge, 5 grams dry sodium carbonate, 1 gram flour, 5 grams silica, 2 grams borax glass. On boiling the precipitates with nitric acid, precipitating the silver by salt, filtering, washing, and scorifying, the silver results were higher than by the crucible method, but the gold results far too low; some gold had dissolved in the nitric acid. Better results were obtained by treating 1.1 A. T. with 20 cc. conc. sulphuric acid (free from nitric) and 60 cc. of water. After boiling one hour, cool, dilute to 100 cc., add 75 cc. of rock salt solution and 20 cc. lead acetate solution. Settle precipitate one hour, filter, wash, dry, and scorify with test lead (30 to 40 grams). The silver thus obtained is higher than the crucible method, but gold lower (about 6 ounces per ton). Writers recommend this latter method. J. W. RICHARDS.

The Copper Mines of Santa Clara Province, Cuba. BY T. W. VAUGHAN. *U. S. Geol. Survey; Eng. and Min. J.*, December 21,

Digitized by Google

1901.—The only mines from which copper has been extracted are the Finca San Joaquin group. Many hundreds of tons of ore, averaging 17 to 20 per cent. copper, have been mined, but the workings are now abandoned and full of water. They will probably pay to reopen and work. Considerable sphalerite has been found in some cases, and the chalcopyrite ore carries considerable gold and silver. Transportation facilities are poor, it being 10 or 12 miles to the nearest railway. J. W. RICHARDS.

Copper Mining in Japan. BY E. W. NARDIN. *Eng. and Min. J.*, December 28, 1901.—An extended description of the principal copper mine in Japan, at Ashio, with method of treatment. (See *this Rev.*, **24**, 15.) J. W. RICHARDS.

Tin Mining in the Malay Peninsula. *J. Franklin Inst.*, October, 1901. From London *Economist*.—The world's yearly supply of tin is 75,000 tons, nearly two-thirds of which comes from Malay. There is here no sign of its production falling off, as there are vast stretches of unexplored land which is probably tin-bearing. The government insists on old land being thoroughly worked before new land is opened. Almost all the tin areas are owned and worked by Chinese; Europeans have found by costly experience that the Chinese coolie, in tin mining, will give a fair day's work only to a Chinese master. J. W. RICHARDS.

Tin Supplies. *Eng. and Min. J.*, December 21, 1901. (From London *Engineering*).—Regarding the "Straits" deposits, Commissioner Swettenham considers it will take a long time to work out the alluvial deposits in the lands already worked, and these comprise but a small fraction of the unexplored lands, where there is every reason to believe tin occurs in paying quantities as alluvial deposits, while no one can guess what the reserves of ore in underground deposits may be. In Australia, an important lode was recently discovered at Wyalong, in New South Wales. J. W. RICHARDS.

The Sudbury Nickel Mines. BY A. MCCHARLES. *Eng. and Min. J.*, December 7, 1901.—The output is now double what it was two years ago. Only three of the ten companies are working their properties; the other seven have failed from various causes, but not from the ore giving out. The deposits are irregular, and cannot be safely tested by diamond drilling; all prospecting is done by shafts; magnetic prospecting is not reliable. All the deep mines are contact deposits at the junction of granite and diorite. Apparently all the nickel deposits in this section have been found. J. W. RICHARDS.

Nickel Aluminum Alloys. *The Al. World*, December, 1901.—A light, strong alloy is made by hardening aluminum by a small percentage each of nickel and copper. "Minckin" is a Ger-

Digitized by Google

man-silver alloy with aluminum, valuable particularly for its resistance to weak acids and alkalies. Siemens and Halske use it in the construction of water-meters. J. W. RICHARDS.

Alumina Reduced by Calcium Carbide. *Min. and Met.*, December 1, 1901. *From J. Soc. Chem. Ind.*—The British experimenters used mixtures of alumina, calcium carbide, and coke in varying proportions, the whole being smelted in an electric furnace, using 150 to 325 amperes at 40 to 95 volts. The conclusions arrived at are: First, alumina is not reduced to any appreciable extent by carbon alone; second, by using alumina, lime, and carbon, a calcium carbide seems to be transiently formed, and reduction of the alumina results to an appreciable extent; third, if carbide is used ready made, with alumina, with or without carbon, the yield of metal is increased; fourth, the operation must last only twelve to fifteen minutes,—longer converts the aluminum reduced into carbide. Air should be excluded, and the alumina should be used in excess of the reducing agents.
J. W. RICHARDS.

A New Aluminum Alloy. *The Al. World*, November, 1901.—Prof. Rolla C. Carpenter, of Cornell University, has patented the alloy consisting essentially of aluminum, 50; zinc, 25; tin, 25. The aluminum is first melted, then the tin added, and lastly the zinc. The alloy has a specific gravity of 3.2 to 3.3, tensile strength 29,000 pounds per square inch, and contracts 8 per cent. in solidifying. J. W. RICHARDS.

Aluminum in India. *The Al. World*, December, 1901.—A communication from A. Chatterton, of the Madras School of Arts, where the working of aluminum into all sorts of artistic and useful metal ware, by native artisans, has made great strides. In the native regiments aluminum utensils have found great favor, and it is only a question of time until brass and copper will be entirely displaced in the army. Hand-made water-bottles have proved eminently satisfactory. Some samples of sheet aluminum were found lacking in proper malleability, and on analysis it was found to contain 98.3 aluminum, 0.6 silicon, 0.9 iron, and 0.3 carbon, while metal with 99.4 aluminum, 0.3 silicon, 0.3 iron, and 0.1 carbon was very satisfactory. Samples of the metal immersed one week in 5 per cent. solutions of citric, tartaric, and acetic acids were very slightly acted upon, averaging $^1/_{12}$ of 1 per cent. loss of weight in one week; but when a 5 per cent. solution of sodium chloride was added, the action was more than doubled with acetic acid and sixty times as great with tartaric and acetic acids. The presence of iron in the metal seems to increase greatly its liability to corrosion. By insisting on iron being kept to 0.25 per cent., no trouble from corrosion of aluminum-cooking utensils is experienced. J. W. RICHARDS.

Digitized by Google

Aluminum at the Pan-American Exposition. *The Al. World*, November, 1901.—The most beautiful feature of the Fair—the illumination—was effected by electricity carried from Niagara Falls over 22 miles of aluminum wire. Five thousand H. P. was carried to the fair grounds, on three cables. An aluminum pavilion containing the exhibit of the Pittsburg Reduction Co. was a very attractive structure. A dozen other firms exhibited cooking utensils, toilet articles, tubing, communion sets, military equipment, engraved ware, electrical appliances, surveying instruments, etc. The U. S. Weather Bureau showed numerous meteorological instruments of the metal. In the Mines building was a fine exhibit of Georgia bauxite and various forms of aluminum, from the crude ingot to finished shapes.

J. W. RICHARDS.

Montana Corundum. BY LEVERETT S. ROPES. *Eng. and Min. J.*, December 14, 1901.—The deposit attracting most attention is on the headwaters of Elk Creek, between the Gallatin Valley and Spanish Creek Basin. The vein is of quartz, separated by bands of hornblende and garnet schist, and between is a band of white friable feldspar carrying 15 to 75 per cent. of corundum in a pay-streak 28 inches wide. The vein has been traced for two miles, and at an intersecting canyon has been found 400 feet down. A mill to work the deposit will be erected in 1902. The corundum is of excellent quality.

J. W. RICHARDS.

Louisiana Rock Salt. BY H. A. TITCOMB. *Eng. and Min. J.*, December 14, 1901.—A hill $2^1/_2$ miles long, 2 miles wide, and 150 to 200 feet high, ten miles southeast of New Iberia, La., called Avery's Island or Petit Anse, is underlaid by a deposit of rock salt into which a bore hole has been sunk 2,000 feet without reaching the bottom. The shaft is cemented for 40 feet, to keep out surface water, and then is sunk 470 feet more through solid rock salt. The salt is mined by pillar and room system, about 50 per cent. being left to support the roof. The salt is broken and sized in a breaker similar to a coal breaker, the total cost of mining and handling being $0.40 per ton. It is of great purity and absolutely free from sand or dirt. J. W. RICHARDS.

Gas for Power in Mexican Mines. *Min. and Met.*, December 1, 1901.—At the copper mine of Nacosari, Sonora, Mexico, owned by Phelps, Dodge, and Co., of New York, all the available water is needed for concentrating work, and gas had to be substituted for steam for power purposes. Coal costs $27 gold per ton, while a cord of wood-mesquite, oak, and pine, weighing about a ton, costs $3 gold. A gas-making plant of the Loomis type is installed, consuming 3 pounds of wood per brake H. P., developed by the gas engines. A similar plant, using Loomis producers

Digitized by Google

and Otto engines, will be installed at Santa Barbara, by the Guggenheim Exploration Co. Here wood is plentiful, but water very scarce, and by using the gas plant the mine can be operated ten months per year instead of barely six. J. W. RICHARDS.

Texas Oil as Fuel. *Eng. and Min. J.*, December 7, 1901.—The Gulf, Colorado and Santa Fe railway has 15 locomotives converted from coal- to oil-firing, and 75 more will be converted. The grate is taken out, the lower part of the fire-box lined with fire-brick, and a brick arch or deflector built in front of the tube sheet. Fire-bricks which soften a little are best, as they bond together better and resist better the shocks of service. The "Booth" and the "Lundholm" burners are both in use. There is a saving in cost of 25 to 40 per cent. in using oil.

J. W. RICHARDS.

Electrochemical and Electrometallurgical Industry. By J. B. C. KERSHAW. *Elec. Rev.*, December 14, 1901. Art. IV.—Progress in Germany: Germany, like England, is deficient in natural water power, but is still making the best use possible of the power at her command. The use of gas engines is extending, improving the prospects of industries requiring electric power. *Copper Refining.*—Nine refineries are operating, but the output is small, and the scarcity of raw copper checks all hopes of an expansion of the industry. *Aluminum.*—The Swiss works at Neuhausen produces yearly 650 tons, with 4,000 H. P.; its branch plant at Rheinfelden, near Basle, started in 1899, uses 5,000 H. P., partly for calcium carbide. The company refuses to state its annual output of aluminum, but it is estimated at 1,500 tons. The company pays over 10 per cent. dividends on a capital of about $3,000,000. *Alkalies and Chlorine.*—The first plant was erected at Griesheim, in 1890, enlarged in 1892, and a branch built at Bitterfeld in 1894. The "Elektron" process used is kept secret, but is supposed to be a diaphragm process. The Algemeine Elektricitäts Gesellschaft, of Berlin, has a plant also at Bitterfeld and at Rheinfelden, using altogether 5,500 H. P. The Badische Soda und Anilin Fabrik works the same process with 2,600 H. P. The Deutsche Solvay Company work the Castner process at Oesternienberg, in Anhalt, using 1,500 H. P. There are altogether 8 works, using over 14,000 H. P. Potassium chloride is the chief raw material. *Bullion Refining.*—Refineries are in operation at Hamburg, Frankfort and Pforzheim. Silver and gold are deposited on the cathodes, while palladium and platinum collect in the anode sludge. At Hamburg the Wohlwill process is used; at Frankfort the Moebius process; at Pforzheim the Diezel process, using copper nitrate as the electrolyte instead of the silver nitrate of the Moebuis process. The value of output of the first two refineries, in 1900, was valued at $12,500,000.

Digitized by Google

Hypochlorites have made greater progress than in any other European country. The cells most widely used are those of Kellner, Vogelsang and Oettel. The installations are mostly in the textile factories of Saxony and Southern Germany. *Calcium Carbide.*—The industry is disorganized from overproduction, carbide selling at $40 per ton. *Nickel* is refined at Siegen by Gustav Menne and Co., and is extracted from Caledonian ore at Papenberg by the Hoepfner electrolytic process, which in 1900 was stated to be producing 1½ tons of nickel daily. *Magnesium* is produced by the electrolysis of carnallite, at Hemelingen. *Sodium* is produced by the Castner process at Rheinfelden, also at Bitterfeld, and by Lucius and Bruning at Höchst-am-Main. *Chromium* and chrome iron alloys are made at Bitterfeld. *Carborundum* is made at Iserlohn under the Acheson patents. *Colors.*—Many of the larger color works are known to use electrolytic methods for reduction and oxidation in the manufacture of dyes and other organic compounds, but no details are published.

J. W. RICHARDS.

Electric Furnace. *Eng. and Min. J.*, December 28, 1901.—A patent to Keller describes a furnace particularly adapted for reduction of chrome ore. The electrodes are mounted on trucks, each adjustable towards a central fire-brick hearth. A layer of carbon granules on this hearth closes the circuit and develops by its resistance the temperature needed. The material to be reduced is spread over the bed of carbon. If carbonization is to be avoided, the granular carbon may be replaced by granular iron, which then alloys with the reduced metal. J. W. RICHARDS.

McCoy's Cathode Plate. *Eng. and Min. J.*, December 21, 1901.—A patent device for enabling cathode sheets of deposited metal, as copper, to be stripped from the cathode, consisting in making circular perforations close together and close to the edge of the plate, and filling them with a non-conducting material, such as abietic acid anhydride and bitumen. The result is to separate the body of the sheet from the edges by a row of perforations, with a thin strip of metal between, which allows the sheet to be removed like tearing apart two postage stamps. The perforations may be ¼ inch in diameter, and within $\frac{1}{100}$ inch of each other; or they may be made continuous, and not through the plate. J. W. RICHARDS.

Minting Machinery and Appliances. BY EDWIN S. CHURCH. *J. Franklin Inst.*, December, 1901.—An illustrated description of the mechanical equipment of the new United States mint, in Philadelphia. As far as preparing the alloys for coins is concerned, the writer mentions the great difficulty in getting uniform results. Even two strips from the same heat will vary, one being within and the other outside of the tolerance, although they have

Digitized by Google

passed through identical operations. The ingots are broken down by a mill driven by a 50 H. P. motor, and finished by a 25 H. P. motor-driven mill. These rolls may be adjusted to $^1/_{2000}$ inch by wedges under the lower roll. The best speed for rolling is 117 feet per minute. Annealing is done automatically in a gas-heated oven; this is a very important operation for the metal. It is to be done by an evenly distributed flame, which must be non-oxidizing. The old idea of "soaking" the metal after it has been brought up to its proper heat, is fallacious. Gold strips pass through the gas-furnace in seven minutes, being cooled by a water spray as they leave it. The planchets, after being stamped, are annealed in rotary gas-furnaces, and then cleaned by being dropped hot into dilute sulphuric acid. The new annealing operations have improved the color of the gold alloy, the naphtha gas flame not oxidizing the copper in the alloy. The article then describes the machines used; no description is given of the parting plant or assaying installation. J. W. RICHARDS.

Alloys as Solutions. BY JOHN A. MATTHEWS. *Eng. and Min. J.*, December 21 and 28, 1901.—The recent activity in the study of alloys is due to: (1) An increased knowledge of solutions. (2) The development of micrography. (3) Improvements in pyrometry. All solid metals are crystalline. The effect of strain is to cause slip lines, looking like minute steps. Surfusion is more common in metals than in alloys. Cooling curves show the freezing-points by a temporary check, which becomes ill-defined in the case of impure metals. Binary alloys may be of two classes: either the constituent metals mix in all proportions or they do not. In the second case, the metals separate on cooling, the lighter on top, but each metal will be found on analysis to contain some of the other. "Very striking analogies exist between ordinary solutions and alloys; in fact, to point out these similarities is to give our present conception of the constitution of alloys." A solid solution is "a homogeneous mixture of two or more substances in the solid state." Zinc-lead, zinc-bismuth, aluminum-lead, aluminum-bismuth, aluminum-cadmium are examples of pairs which do not mix in all proportions, but each can dissolve a little of the other, this solubility itself being a function of the temperature, so that it appears likely that at some temperature the solubility curves would meet, and the two metals be, at that temperature, miscible in all proportions. There is a certain amount of molecular freedom in solids, example, solid gold diffusing into solid lead even at ordinary temperatures. We practically apply this principle in all annealing operations. During cooling of binary alloys from a fused state, those alloys which mix in all proportions may or may not form chemical combinations. These latter are undoubtedly formed in some cases, but most of the metallic alloy formulas mentioned in scientific literature of the last

Digitized by Google

ten years are very improbable. The idea that if definite crystals could be isolated from an alloy they were certainly a chemical compound is not to be relied upon. Such crystals are of varying composition, and the true chemical compound is only certainly indicated by the maximum fusing-point in between two minima, as shown on the chart of melting-points. Pure metals, intermetallic compounds, and eutectic alloys give the same simple cooling curve, since they have only a single melting-point. Eutectic alloys are those alloys of a series which have the lowest freezing-point, are constant in composition, and which are not chemical compounds of the metals composing them. The freezing-point curves of binary alloys which are simply homogeneous mixtures show a regular variation from the freezing-point of one metal to that of the other. Where the two metals form a eutectic, the freezing-point rises on both sides of the eutectic alloy to that of the pure metals. Then the freezing-point curve shows a minimum melting-point (eutectic) followed by a maximum and then another minimum (eutectic); the maximum between the two eutectics corresponds to a definite chemical compound, while the eutectics on either side are the most fusible mixture of this compound with the pure metals of higher fusing-points. Microscopical investigation confirms these deductions. Many alloys are described, both by cooling curves, freezing-point diagrams and microphotographs, and the article is an important contribution to the study of alloys. J. W. RICHARDS.

Work of W. Spring. *J. Franklin Inst.*, November, 1901.—A résumé of the work of Spring in compressing metallic powders. J. W. RICHARDS.

Shimer's Combustion Apparatus. *J. Franklin Inst.*, November, 1901.—A report of the Committee on Science and Arts, recommending the award of the Scott medal to the inventor for "the ingenuity displayed in the construction of this device, and its great practical value." J. W. RICHARDS.

ORGANIC CHEMISTRY.

Phenomena of Dissociation with Monatomic Alcohols, Ethers, and Salts. By J. U. NEF. *Ann. Chem.* (Liebig), **318**, 137–230.—In line with the data collected during recent years concerning the dissociation of primary and secondary alcohols, their salts and ethers, the following is to be expected: 1. The alkylidene formed by the dissociation of these compounds may be used for alkylation, *i. e.*, it can take up by direct addition ammonia, amine, benzene, malonic ester, etc. 2. The alkylidene, under favorable conditions, may, by intramolecular alkylation, be converted directly into an olefine or trimethylene. 3. The alkylidene can decompose water or metallic hydroxides, already

Digitized by Google

present or produced by dissociation, giving first hydrogen and an aldehyde or ketone, the latter partly changing to condensation products. The aldehydes may also react further with water or metallic hydroxide, finally passing into the corresponding fatty acid with liberation of hydrogen. These expectations, the author states, have been realized in every respect, and furnish a simple explanation of all known reactions of the alcohols and ethers. *I. Alkylation with sodium alcoholates. A. Alkylation of amines.*—Salts of primary and secondary alcohols possess a lower dissociation temperature than the free alcohols, and are therefore less stable. On the other hand, salts of the tertiary alcohols are much more stable than the corresponding free alcohols, and, therefore, possess a higher dissociation temperature. Although the tertiary alcohols dissociate at low temperatures, they may occasionally, analogous to the action of dissociated ammonium chloride, reunite upon cooling. From this it might be expected that by heating a compound like aniline, which can be alkylated, with the sodium salt of a primary or secondary alcohol to the temperature of dissociation of the latter, alkylated anilines and sodium hydroxide would result: $C_6H_5NHH + NaOCHRR' = C_6H_5NHH + :CRR' + NaOH = C_6H_5NH.CHRR' + NaOH$. In corroboration of this, ethylaniline was prepared from aniline and from acetanilide, isobutyl- and isoamylaniline from acetanilide. No dialkyl derivatives were obtained. *B. Alkylation of fatty acids.*—When silver acetate is treated with ethyl iodide, the ethylidene from the dissociation of the ethyl iodide unites with the acetic acid set free from the silver acetate by the action of the hydriodic acid and yields ethyl acetate, since the acid hydrogen of acetic acid is much more readily dissociated than the three others : $CH_3COOAg + IHCH.CH_3 = CH_3COOHAgI + :CH.CH_3 = CH_3COO.CHH.CH_3 + AgI$. When the alkylidene is liberated under conditions where only the acetyl group of acetic acid is present, the reaction proceeds in a somewhat different manner : $C_6H_5(C_2H_5)N.CO.CH_2H + NaOCHRR' = C_6H_5(C_2H_5)N.CO.CH_2H + :CRR' + NaOH = C_6H_5(C_2H_5)N.CO.CH_2CHRR' + NaOH = C_6H_5(C_2H_5)NH + RR'CH.CH_2COONa$. In this case, since the alkylidene does not react with ethylaniline, and since the hydrogens of the acetyl may also be dissociated, a monoalkyl acetic acid results. In this manner the author prepared *n*-butyric, *i*-butylacetic and *i*-amylacetic acids. *C. The action of sodium isoamylate upon form-ethylaniline.*—Dissociation studies with these substances yielded, among others, the following results: 1. Sodium amylate, in amyl alcohol solution, decomposes at 300°–330° with production of valeraldehyde, hydrogen, *i*-amylidene, and sodium oxide. 2. The valeraldehyde is then converted by the isoamylidene into α-isoamylvaleraldehyde, which is further reduced by the nascent hydrogen to the corresponding decyl alcohol. 3. Valeraldehyde, in presence of the alkali, also suffers aldol condensation to valer-

Digitized by Google

aldol, from which, by loss of water, α-isopropyl β-isobutyl acrolein results, or, by addition of hydrogen, a 1,3-decyl glycol, α-isobutyl-β-isopropyltrimethyleneglycol, is obtained. 4. Valeraldehyde is partly converted, by the alkali present, into alkaline valerianate. In the presence of formethylaniline an alkylation of the formyl occurs, since the methylene derivative formed from the decyl glycol by dissociation yields an oxy-acid, 2,isobutyl,3, isopropyl,4,butanol acid, and ethylaniline. *II. The dissociation of sodium alcoholates alone or in presence of potash- or soda-lime.*—Salts of the primary or secondary alcohols are completely dissociated at 250°–350°, with formation of olefines, due to a rearrangement of the alkylidene first formed. In the presence of potash- or soda-lime no olefine is formed, the primary sodium alcoholate being converted quantitatively, with evolution of hydrogen, into the salt of the corresponding acid. Tertiary alcoholates should pass direct, therefore, into the olefines. The sodium salt of tertiary amyl alcohol is very stable and is decomposed only at 330°–350°, with formation of small amounts of trimethylethylene and much methane and hydrogen. In the presence of potash-lime, only methane, hydrogen, carbonate and propionate are found. *III. The spontaneous combustion of sodium alcoholates in the air.*—On account of the low dissociation temperatures of the sodium alcoholates, it might be expected that the alkylidene liberated would spontaneously inflame in the air. The observations of Hemmelmayr (*Monatsh. Chem.*, **12**, 151) were confirmed by the author. He believes that the formation of carbonic acid is due to the combustion of dissociated sodium formate, while the production of formic acid is at least partly explained by the combustion of methylene from the dissociation of alcoholates, aldehydes, and salts of fatty acids. *IV. The behavior of sodium alcoholates toward benzophenone.*—The reductions by means of alcoholic potassium hydroxide or sodium methylate are to be explained as follows: the alkylidene resulting from the dissociation of the alcoholate decomposes the alkali present with formation of an aldehyde or ketone, liberating hydrogen, the latter causing the reduction. The aldehyde formed is partly converted by the alkali into the salt of the corresponding fatty acid, hydrogen being evolved, while part may also be changed to condensation products. Thus benzophenone, heated with sodium isobutylate to 190°–220° gave, besides benzhydrol and other substances, 1,dimethyl,2,diphenylpropionic acid, $(C_6H_5)_2CH.C(CH_3)_2COOH$, water-clear plates (from ligroin), m. p., 134°–135°, whose formation can only be explained by an alkylation of the isobutyric acid produced by the diphenylmethylene from the sodium benzhydrol. *V. Final remarks on the behavior of salts of alcohols.*—The observations of Berthelot and others that carbonic oxide with alcoholic potassium hydroxide, sodium methylate or ethylate, gives mainly

Digitized by Google

formate, together with small amounts of propionate, are explained by the union of carbonic oxide with the sodium hydroxide split off in the dissociation of the sodium alkylate, the propionate being formed from this by a partial alkylation. The researches of Geuther and his pupils, upon the action of carbonic oxide upon mixtures of sodium alcoholates and salts of fatty acids should, therefore, be revised, since, according to the author's investigations, the salt of the fatty acid plays no part whatever in the reaction. The difference in the behavior of the barium and calcium salts upon dry distillation is explained from a similar standpoint, and also the effect of heat upon aluminum alcoholates. *VI. The dissociation of monatomic alcohols and their ethers.*—The following conclusions are arrived at, concerning the effect of heating primary or secondary alcohols (or their ethers) to the point of dissociation: 1. The alkylidene may decompose water split off, with formation of an aldehyde or ketone, and liberation of hydrogen: $RR'CH.OH = RR'C: + OHH = RR'CO + HH$. 2. The alkylidene, by intramolecular alkylation, may change partly to an olefine. 3. The alkylidene may be partly reduced to a paraffin by the hydrogen liberated. 4. The aldehyde or ketone, formed in 1, may further decompose water with production of the corresponding fatty acid and liberation of hydrogen. 5. The aldehyde or ketone formed in 1, and the acid formed in 4, may dissociate separately in one of two ways—either an alkylidene dissociation may occur, the alkylidene then being changed by reactions 2 and 3, or a successive splitting off of methylene (or its homologues) may take place. *VII. The dissociation of fatty acids and their salts.*—The following changes are produced by the action of heat upon fatty acids or their salts: 1. A dissociation into alkylidene and formic acid. 2. A successive splitting off of methylene or alkylidene: $CH_3CH_2CH_2COOH = CH_3CH_2COOH + :CH_2 = CH_3COOH + 2\ :CH_2 = H.COOH + 3\ :CH_2$. 3. A rearrangement into olefine of part of the alkylidene generated. 4. Since formic acid decomposes completely at 169° into water and carbonic oxide, dissociations of fatty acids at temperatures of 400°–600° must yield C_nH_{2n}:, carbonic oxide and water. The latter is then decomposed partly by the carbonic oxide, with formation of carbonic acid and hydrogen, and partly by the alkylidene, with production of an alkylene oxide (aldehyde or ketone). 5. The liberated hydrogen then reduces part of the alkylidene to paraffin. *VIII. Conclusion.—A. The electrolysis of fatty acids.*—The electric current dissociates salts of the fatty acids even at 0° into alkylidene and formate; the former of these, by intramolecular alkylation, may be partly changed to olefine, or it may partly take up sufficient hydrogen to form the alkyl which is then polymerized to dialkyl, or it may act partly to esterify the acid present. *B. The oxidation of ketones*, the *Beckmann reaction*, the conversion of *bromamides* into *amines*, are all likewise explained

Digitized by Google

by dissociation reactions involving the production of alkylidenes. *C. The action of sodium upon nitriles and isonitriles.*—The formation of nitriles and isonitriles from cyanides and alkylogens has been referred to the union of hydrocyanic acid with alkylidenes. This reaction is reversible. The action of sodium upon alkyl cyanide and isocyanide should, therefore, give analogous results to the action of sodium upon alkylogens, *i. e.*, the HCN or HNC formed by dissociation, reacts with the sodium, producing sodium cyanide and liberating hydrogen ; the alkylidene, on the other hand, may rearrange to an olefine, or it may be reduced to alkyl and paraffin, while the alkyl may be polymerized to the dialkyl.

M. T. BOGERT.

On the Preparation of Triphenylmethane. BY JAS. F. NORRIS AND GRACE MCLEOD. *Am. Chem. J.*, **26**, 499–505.—The authors have made a careful study of the preparation of triphenylmethane from chloroform, aluminum chloride and benzene. It has been frequently observed that at a certain point in the distillation of the crude reaction product hydrochloric acid is evolved, showing the presence of some halogen compound. The composition of the first reaction mixture, after decomposing the aluminum addition product in the presence of a large amount of carbon bisulphide, was therefore made the subject of further investigation. When the carbon bisulphide solution was dried with calcium chloride and allowed to evaporate in a current of air, a dark brown oil remained, about half of which solidified in crystals of *triphenylcarbinol*, while no further crystals could be obtained from the residual oil. Not the least trace of triphenylmethane could be found in this material, but when some of the original oil was distilled, a good yield of the hydrocarbon was obtained. It is possible that the triphenylmethane is the first product, but is then immediately oxidized to the carbinol by the air. Aluminum chloride converts triphenylcarbinol partly into the corresponding chloride, and small amounts of this latter substance may therefore be present. The oily part of the original reaction product appears to be a complex condensation product which is completely decomposed on distillation, thus reducing the triphenylcarbinol to the corresponding hydrocarbon. M. T. BOGERT.

The Three Stereomeric Cinnamic Acids. BY ARTHUR MICHAEL. *Ber. d. chem. Ges.*, **34**, 3640–3666.—An 85 per cent. yield of phenylpropiolic acid may be obtained by gradually adding cinnamic bibromide (m. p., 201°) to very dilute potassium hydroxide, filtering from bromstyrene after several hours, precipitating α-bromcinnamic acid in the filtrate, which, on drying and fusing, yields the pure α-bromcinnamic acid, and then decomposing this by heating four hours with 20 per cent. potassium hydroxide. By standing twelve hours in a refrigerator with concentrated hydrobromic acid, the phenylpropiolic acid is changed

Digitized by Google

to *β-bromallocinnamic acid* (m. p., 159°), which, when treated with zinc dust and alcohol, yields three stereomeric cinnamic acids. The ordinary cinnamic acid is separated from this mixture by its difficultly soluble calcium salt; the allo- and isocinnamic acids are separated by means of their barium salts, the barium salt of the former being difficultly soluble in methyl alcohol, while that of the latter is very easily soluble. The three acids may be similarly obtained from the *α*-bromallocinnamic acid, but the yield of iso acid is not so good. *β*-bromcinnamic acid (m. p., 134°), *β*-chlorallocinnamic acid (m. p., 142°), and both *β*-iodocinnamic acids yield, on reduction, only cinnamic acid and no isomers. The isocinnamic acid is to be regarded as a true chemical individual, and there exist, therefore, three stereomeric cinnamic acids. Cinnamic ester adds bromine in the dark with production of a mixture of stereomeric bibromides. While cinnamic acid, therefore, in its physical properties and stability acts like a fumaroid compound, yet in its addition of halogens it approaches the behavior of a maleinoid form. These peculiarities lead the author to remark as follows: "The stereochemical course of a reaction in the transition from unsaturated bodies to saturated, or the reverse, is dependent upon the chemical forces set in action, and is, therefore, not only a function of the atoms present in the molecule, but also of the attacking reagent." *Isocinnamic acid*, m. p., 36°–37°. $C_{18}H_{14}O_4Ba + 2H_2O$ is soluble in 4 parts of acetone at 20°, in 5 parts of water, and in 0.3 part methyl alcohol. $C_{18}H_{14}O_4Ca + 2H_2O$ dissolves at 20° in 5 parts acetone, 4 parts water, and is but little soluble in methyl alcohol. $C_{18}H_{14}O_4Sr + 2H_2O$, $C_{18}H_{14}O_4Mn + 3H_2O$; $C_{18}H_{14}O_4Cd$, prisms, m. p., 125°–135°. Aniline salt, m. p., 70°–71°. The *isocinnamic acid* (m. p., 57°) of Liebermann is regarded by the writer as a mixture. *Allocinnamic acid*, m. p., 68°. Oxidized at low temperature with potassium permanganate, it yields racemic phenyl glyceric acid (m. p., 121°). $C_{18}H_{14}O_4Ba + 3H_2O$ dissolves at 20° in 124 parts acetone, 15 parts water, and 38 parts methyl alcohol. $C_{18}H_{14}O_4Ca + 3H_2O$, $C_{18}H_{14}O_4Sr + 3H_2O$, $C_{18}H_{14}O_4Mn + 2H_2O$, but little soluble in water. $C_{18}H_{14}O_4Cd + 2H_2O$, very little soluble in water. *Hydrocinnamic Acid.*—Barium salt dissolves in 1000 parts methyl alcohol at 25°; calcium salt is soluble in 23 parts water at 27°. Phenylpropiolic acid with concentrated hydriodic acid at 0° gives *β-iodocinnamic acid*; leaves, m. p., 127°–129°, easily soluble in carbon disulphide, alcohol, ether, benzene, but little soluble in water; and *β-iodoallocinnamic acid*, m. p., 186°–188°, crystals, but little soluble in carbon bisulphide, alcohol or water. Cinnamic ester, treated in the dark with bromine in carbon tetrachloride solution, yields, in addition to the ordinary bibromide, the *cinnamic ethyl ester allobibromide*, m. p., 28°–30°, prisms, easily soluble in ether, carbon bisulphide

Digitized by Google

or chloroform. The *methyl ester allobibromide* melts at 50°–53°. *Cinnamic acid allobibromide*, m. p., 89°–91°.

M. T. BOGERT.

The Condensation of Carbon Tetrachloride with Halogen Derivatives of Benzene by Means of the Friedel and Crafts Reaction. BY JAS. F. NORRIS AND ERIK H. GREEN. *Am. Chem. J.*, **26**, 492–499.—The action of carbon tetrachloride upon benzene in presence of aluminum chloride gives triphenylchlormethane, and the present paper records the results obtained in endeavoring to prepare similar triphenylmethane derivatives from other aromatic hydrocarbons by the action of these reagents. *4,4'-Dichlorbenzophenone chloride.*—Obtained by the action of aluminum chloride upon a carbon bisulphide solution of carbon tetrachloride and chlorbenzene at the ordinary temperature or at the boiling-point of the bisulphide. A pale green very viscid liquid of peculiar odor, soluble in carbon bisulphide, petroleum ether or ether, slightly soluble in cold alcohol, insoluble in water, b. p., 217°–219° (corr.) at 38 mm. A small amount of an *unknown substance* was also obtained, in long colorless needless, melting at 66°–68°. *4,4'-Dichlorbenzophenone.*—This may be obtained from the chloride by heating it with water or with dilute alcohol, also by dissolving it in concentrated sulphuric acid, and then diluting. It has already been described by Dittrich (*Ann. Chem.* (Liebig), **264**, 175), and is readily soluble in carbon bisulphide, chloroform, ether, glacial acetic acid, and hot dilute alcohol or acetone. From dilute alcohol, it crystallizes in glistening pearly plates, m. p., 144.5°. *4,4'-Dibrombenzophenone chloride* was prepared in similar manner from brombenzene, but it could only be obtained as a dark oil which decomposed on distillation even under reduced pressure. From it was obtained the *4,4'-Dibrombenzophenone* m. p., 171°–172°, identical with that described by Hoffmann, soluble in carbon bisulphide, chloroform, benzene, and in hot alcohol or acetone. From paradichlorbenzene was produced, by similar treatment, the *2,5,2',5'-tetrachlorbenzophenone chloride*, in colorless leaflets, m. p., 173°–174°, easily soluble in chloroform, benzene, and acetone, less readily in ether, very slightly soluble in hot alcohol or in concentrated sulphuric acid. Boiled with dilute alcohol or heated with dilute alcohol or water at 130°, it yields the *2,5,2',5'-tetrachlorbenzophenone*, which crystallizes in large colorless feathery plates, m. p., 128°, readily soluble in hot alcohol, petroleum ether, carbon bisulphide, benzene, acetone, ethyl acetate and chloroform, less easily in cold alcohol or in concentrated sulphuric acid. The preparation of symmetrical halogen substituted ketones in this way appears to be much more satisfactory than the condensation of substituted benzoyl chlorides with halogen benzenes. The alkyl carbon atom generally enters the ring para to the halogen. Parabibrombenzene, anisol, mesity-

Digitized by Google

lene, dimethylaniline and naphthalene all react readily at ordinary temperatures with carbon tetrachloride and aluminum chloride; symmetrical tri- and tetrabrombenzene apparently do not.

M. T. BOGERT.

Primary Arsines. BY ARTHUR W. PALMER AND WILLIAM M. DEHN. *Ber. d. chem. Ges.*, **34**, 3594–3599.—It has already been shown by Palmer (*Ber. d. chem. Ges.*, **27**, 1378 (1894)) that dimethylarsine may readily be prepared by the reduction of dimethylchlorarsine, and the authors have now succeeded in obtaining primary arsines also. The preparation of *monomethylarsine* from methyldichlorarsine is difficult and unsatisfactory, but it is easily obtained by the reduction of methylarsonic acid $CH_3AsO(OH)_2$. Sodium methylarsonate is reduced by amalgamated zinc dust and hydrochloric acid in alcoholic solution, in an atmosphere of hydrogen, by means of a specially constructed apparatus. All air must be carefully excluded during the entire reaction, or the arsine is immediately oxidized to a glistening red substance whose chemical nature is not yet explained. Monomethylarsine is a colorless mobile liquid, b. p., 2°, at 755 mm., 17° at 1.5 atmospheres. It has a penetrating repulsive odor like cacodyl, forms thick white clouds when air is admitted, does not inflame spontaneously (differing in this respect from dimethylarsine), and in the presence of dry oxygen forms the solid methylarsinoxide (m. p., 95°) and methylarsonic acid. The latter substance does not appear when calcium chloride is added to absorb the water which is split off in the formation of the methylarsinoxide. Concentrated nitric acid oxidizes it to arsenious acid and monomethylarsonic acid. By the action of iodine and absolute alcohol, arsinmethyliodide is produced. *Monophenylarsine* may be obtained by the reduction of calcium phenylarsonate, contrary to the experience of LaCoste and Michaelis (*Ann. Chem.* (Liebig), **201**, 203, 209). It is a transparent highly refractive oil, boiling at 148° under ordinary pressure, easily soluble in alcohol or ether. When concentrated, its odor somewhat recalls that of phenylisonitrile, but when dilute, it is pleasant and hyacinth-like. In the air it oxidizes to a yellow solid, from which boiling chloroform extracts a substance melting at 195°–208°, which is probably arsenobenzene. Monophenylarsine is vigorously attacked by concentrated nitric acid with production of monophenylarsonic acid and a yellow oil whose nature will be further investigated.

M. T. BOGERT.

BIOLOGICAL CHEMISTRY.

Note on the Glycosuria Following Experimental Injection of Adrenalin. BY C. A. HERTER AND A. N. RICHARDS. *N. Y. Med. News*, **80**, 201–203.—Adrenalin given intraperitoneally is

Digitized by Google

capable of producing a marked glycosuria, in which the sugar may reach 9.17 per cent. and the ratio of nitrogen to dextrose as 1 to 4.98. This glycosuria is not dependent on the presence of a diastatic ferment stored or formed by the suprarenal gland. Adrenalin injections are sometimes followed by destructive lesions of the gastro-intestinal tract. After a fatal dose of adrenalin the cells composing the islands of Langerhans, are found to be the seat of granular degeneration. With equal doses of adrenalin the intraperitoneal injections proved much more efficient in the production of glycosuria, than injections given subcutaneously.

F. P. UNDERHILL.

On Phlorhizin Diabetes. BY GRAHAM LUSK. *Zeit. f. Biol.*, **42**, 31–45.—In phlorhizin diabetes no sugar originates from fat. The calorific value, which is lost by the elimination of sugar, is compensated by the increased proteid exchanges. While with the fasting, phlorhizin diabetic dog the ratio of nitrogen to dextrose is as 1 to 3.75, in the rabbit, the goat and the cat, it is as 1 to 2.8.

F. P. UNDERHILL.

On the Relation of Lipase to Fat Metabolism.—Lipogenesis. BY A. S. LOEVENHART. *Am. J. Physiol.*, **6**, 331–351—The reversible action of lipase furnishes an explanation of fat absorption. Lipase is found in all tissues of the body that have been tested, notably in the liver, active mammary gland, blood, lymph and intestinal mucosa. Special interest attaches to the fact that lipase has been found in considerable quantities wherever fat synthesis is known to take place. The storing and translocation of fats may be called "lipogenesis," the process being analogous to "glycogenesis." Both phases of lipogenesis may be brought about by the enzyme lipase, which is either fat-forming or fat-splitting, according to conditions. From the fact that lipase is unable to synthesize ethyl butyrate from sodium butyrate and alcohol, the conclusion is drawn that free fatty acids rather than the soaps exist in the blood and lymph. The fatty changes occurring in phosphorus poisoning are not due to changes in the distribution or amount of lipase in the tissues. A study of the limit of the action of lipase on ethyl butyrate shows that the limit is nearly proportional to the amount of enzyme acting, and that it is nearly independent of an excess of ethyl butyrate. (For a former paper see *Am. Chem. J.*, **24**, 491.)

F. P. UNDERHILL.

The Excretion of Nitrogen during Nervous Excitement. BY FRANCIS GANO BENEDICT. *Am. J. Physiol.*, **6**, 398–411.—After bringing the human subject into nitrogenous equilibrium, strong nervous excitement was brought about by the subject attending the great intercollegiate football games. All other conditions, as to diet, etc., remained the same. The results of the experiments,

Digitized by Google

two in number, would seem to indicate that the nitrogen metabolism undergoes no noticeable change during periods of intense nervous excitement. The methods of experimentation were those usually employed in metabolism experiments.

F. P. UNDERHILL.

The Liberation of Volatile Sulphide from Milk on Heating. BY LEO. F. RETTGER. *Am. J. Physiol.*, **6**, 450–458.—On heating normal milk above 85° C. a partial decomposition of the milk proteids, occurs, which is indicated by the liberation of a volatile sulphide, probably hydrogen sulphide. The amount of sulphur given off is small, but of sufficient quantity to be easily recognized by the blackening of lead acetate paper and lead acetate cotton, and the decolorization of dilute potassium permanganate solution. Alkalies and alkaline reacting phosphates facilitate this decomposition, while acids and acid-reacting phosphates retard it. Hence the amount of sulphide liberated depends largely upon the reaction of the milk. F. P. UNDERHILL.

Studies on the Physiological Effects of the Valency and Possibly the Electrical Charges of Ions. BY JACQUES LOEB. *Am. J. Physiol.*, **6**, 411–434.—Artificially fertilized eggs of the marine fish, *Fundulus*, were distributed in the various salt solutions, and the embryos counted after two or three days. The salts of monovalent cations (Na, Li, K, NH_4) with monovalent anions (Cl, NO_3, CH_3COO) exert a toxic effect at certain concentrations. This toxic effect can be annihilated through the addition of a small amount of a salt having a bivalent cation. For sodium chloride, it is shown that trivalent cations exhibit even a much more energetic antitoxic effect than bivalent cations. The toxic effects of salts with a monovalent cation, and a monovalent anion can be annihilated only by bi- or trivalent cations, but not by mono-, bi-, or trivalent anions. In experiments upon frog's muscle it is shown that the poisonous effects of salts with a univalent cation are due to the negative charges of the anions, and that a small amount of a salt with a bivalent cation, by means of its positive charges, acts antitoxically to the latter.

F. P. UNDERHILL.

SANITARY CHEMISTRY.

The Bacteriological Analysis of Water and Its Interpretation. BY CHARLES EDWARD AMORY WINSLOW. *Journal of the New England Water Works Association.* 1901 (15). pp. 459–483.—"In determining the number of bacteria in a given quantity of water, the extreme delicacy of the test renders imperative the utmost care in the technique, for a speck of dust, a delay of a few hours, or a mistake in the preparation of the nutrient gelatin, may introduce an error in excess of the normal difference between

Digitized by Google

the purest and the most polluted drinking water. To guard as far as possible against such errors, attention is called to the following points:

In the collection of the sample, it must be certain that the small portion taken represents the whole body of water from which it is taken.

In plating, the plates should be made as soon as possible after the collection of the sample, often best in the field, and if this is not advisable, the samples should be packed in ice, which works well if the delay is not too long, and with relatively pure waters. The amount of sample used should be such that the number of colonies developing on the plate shall not be less than ten or over two hundred.

In preparing the culture medium the methods outlined by the committee of the American Public Health Association in 1897 should be followed. (*Public Health Papers and Reports American Public Health Association*, **23**, 56 (1897).)

The plates should be kept in the dark and in a moist atmosphere, and as the sewage bacteria develop rapidly, an arbitrary short period of time, three or four days, adopted by most bacteriologists in this country, is better than the seven to fifteen days recommended by French bacteriologists. As to the interpretation of results, the arbitrary standard of Dr. Sternberg, namely, that a water containing less than 100 bacteria per cubic centimeter is presumably from a deep source, and uncontaminated by surface drainage; that one with 500 is open to suspicion, and that one with over 1000 bacteria is presumably contaminated with sewage or surface drainage is probably as satisfactory as any arbitrary standard that could be devised. Any such standard must, however, be applied with great caution. The source of the sample is of vital importance. A bacterial count which might condemn a spring might be quite normal for a river; only figures in excess of those common to unpolluted waters of the same character give the indication of danger. In pure rain-water, if present at all, the bacteria range from units to tens; this is also commonly true for springs and deep wells, though Sedgwick and Prescott have sometimes found 200 and 300 in the deep wells and springs among the hills of New Hampshire. In lakes, ordinary counts will not fall below 10, or rise above 500. In rivers, even when unpolluted by sewage, the water may, at times, contain thousands of bacteria, and the bacterial counts are usually higher from September to April than from April to September.

It is not the large number of bacteria that are directly harmful. The source of danger lies in the comparatively small proportion of disease germs, so small a proportion as to be practically beyond the reach of our method of analysis. But excessive numbers point, like free and albuminoid ammonia, only with more certainty

Digitized by Google

and delicacy, to the presence of putrefying organic matter which gains access to a water supply from sewage or fresh surface drainage. In either case, the entrance of specific germs of diseases is possible, and the water should not be delivered to consumers.

The isolation of specific organisms is very often most difficult, and the isolation of the typhoid germ from water has never yet been satisfactorily proved. On the other hand, the isolation of *B. coli* is not so very difficult, although as yet no standard set of reactions have been adopted in this country. The exact significance of the *B. coli* has been questioned, but if the *B. coli* occurs in sufficient quantity in water to be isolated in a large proportion of cases when 1 cc. of that water is taken, it is reasonable proof of serious pollution. LEONARD P. KINNICUTT.

The Efficiency of the East Providence Mechanical Filters. *Eng. Rec.*, 1901 (44), 545-546.—The original installation, rated for one-half million gallons daily, was constructed under the direction of Mr. Edmund B. Weston, in 1889 by the New York Filter Manufacturing Company, now the New York Continental Jewell Filtration Company. The capacity of the plant has recently been doubled and the operation of the filter during the last twenty months, as shown by the results of monthly samples analyzed under the direction of the secretary of the Rhode Island State Board of Health, is most satisfactory. During the four months, April to July, 1900, 0.75 grain of aluminum sulphate per gallon was used; the removal of color ranged from 76 to 91 per cent., average 83 per cent., and the average bacterial reduction was 95.26 per cent. During the sixteen months, August, 1900, through November, 1901, one grain of aluminum sulphate containing 22 per cent. Al_2O_3 was used; the average bacterial reduction equaled 99.23 per cent., and the average removal of color was 90 per cent., ranging from 83 to 100 per cent. The average number of bacteria in the raw water was a little over 700 per cubic centimeter; in the filtered water, 24; leaving out March, 1901, the average number was only 12.

LEONARD P. KINNICUTT.

Note on the Working of Sand Filters for Water Filtration. BY HENRY F. FULLER. *Eng. Record*, 1901. (44), 481-482.—A few years ago it was believed that one of the main functions for the sand was to uphold the surface film, on which film the efficiency of the filter virtually depended, and that if this surface film was broken up, an immediate deterioration of the filtrate, from a bacterial point of view, followed. In the working of large plants, great inconveniences are, however, often caused in the spring and summer months, by the very rapid clogging of the filter from the formation of a film which, although of extreme tenuity, is suffi-

Digitized by Google

cient to prevent the passage of water. Filters, which at other times may continue to filter efficiently for two or even three months without the necessity of removing the top surface of sand will, at the seasons mentioned, be rendered useless after five or six days' work. In consequence of experiments made by Mr. Clark, chief chemist, Massachusetts State Board of Health, and communicated to Mr. Fuller, he tried the effect of breaking up this surface film. Working on a plant, having a capacity of 25 million gallons per day, he found that the breaking up of the surface film by means of a heavy rake resulted in greatly increased facility of working and material reduction of expense, while the high character of the filtrate was fully maintained. The result of the disturbance of the film was often curious; a filter which showed signs of clogging up within six days after cleaning would, after the above treatment, frequently work three or four weeks before requiring further disturbance. It was also found that the film could be broken up three or four times before cleaning became necessary. LEONARD P. KINNICUTT.

Operations of the Albany Water Filtration Plant. *Eng. News*, 1901, **46**, 427.—The beds have been in use, since first started, 774 days, and have filtered 10,059,075,000 gallons, for a total cost of $46,917, or $4.65 per million gallons

The average run of each filter has been 25.1 days, and 67,300,000 gallons have been filtered each run, at an average daily rate of 2,698,000 gallons per acre.

The bacterial efficiency has averaged 99.1 per cent. During the year 1900–1901, forty-eight tests were made for *B. coli*. They were found in every sample of unfiltered water, and averaged 18 per cubic centimeter. In thirty-one cases the filtered water gave negative results, and in the remaining seventeen, the average was 1 per cubic centimeter.

Since the introduction of filtered water, the general death-rate has been reduced 19 per cent. The death-rate from diarrheal diseases was, in 1900, 44.17 per cent.; and in 1901, 60 per cent. less than the mean of the ten previous years, and the reduction of the death-rate from typhoid fever was 58.33 per cent. in 1900, and 67.88 per cent. in 1901. Of the twenty-seven deaths from typhoid fever in 1901, eight were alien cases, two from infected milk, leaving only seventeen deaths as not proved to causes outside the city. LEONARD P. KINNICUTT.

Water Supplies of Vermont. BY CHARLES P. MOAT, Chemist, Vermont State Laboratory of Hygiene. *Journal of the New England Water Works Association*. 1901 (15), 514–521.—This paper gives a short account of the so-called public water supplies of the villages and cities of Vermont, and the analyses, in tabulated form, of these waters. The chlorine in most of these waters is below 0.10 part in 100,000, and although the author states

Digitized by Google

that he is not yet prepared to give the normal chlorine for Vermont, he believes it differs but little in different parts of the state, and is very similar to that of western Massachusetts.

LEONARD P. KINNICUTT.

Bacteria in Ice. By H. W. CLARK, chief chemist, Massachusetts State Board of Health. *Jour. of the Mass. Association of Boards of Health*, 1902 (9), 124–133.—This paper, also published by the Massachusetts State Board of Health, in its report for 1900, is an account of experiments made at the Lawrence Experiment Station, during the winters of 1899–1900 and 1900–1901, in regard to the retention of bacteria in ice during the freezing of water, and the examination of ice samples from various supplies in use, and also from ponds and rivers not used as ice supplies. Experiments were made to determine the number of all kinds of water bacteria present in the water frozen, and the number which are retained in the ice when it is formed naturally on the surface of water. Experiments were also made upon the retention of *B. coli* and *B. typhosus*, under like conditions. The experiments showed that *B. coli* was not retained in ice from ordinarily polluted water, when the ice was obtained by still freezing, either in the tanks used for the experiments, or in the ice from the ponds examined. *B. typhosus* was retained twice out of four experiments when the ice was formed from water to which laboratory cultures of this germ had been added, but this may have been owing to particles of the media, in which it was grown, floating on the water, as the typhoid germ probably has no greater tendency to float than do other bacteria. Ice obtained by freezing the Merrimac river water, contained less than 2 per cent. of the total number of bacteria of all kinds contained in the water, nearly as good a result as is obtained from this same water by sand filtration. In ice obtained by freezing Merrimac river water, to which 5 per cent. of sewage had been added, *B. coli* and a large number of other bacteria were retained. In the examination of ice from the Merrimac, none of the fourteen samples formed upon the comparatively slowly moving river water, between Lawrence and Lowell, contained *B. coli*, and the bacterial efficiency of freezing, as shown by the samples, even including the bacteria in the top ice of each cake, was 99.78 per cent. Of the three samples of river water, however, collected from the river above Lowell, one contained *B. coli* but none of the samples of river ice delivered at the experiment station contained *B. coli*, these samples of ice having been stored in an ice-house for periods varying from a few weeks to several months, before delivery at the station.

The conclusions derived from these experiments, as stated by Mr. Clark, are as follows: "On the whole it is evident that the conditions surrounding water when it freezes, are very important

Digitized by Google

factors in determining the purity of the ice formed. If there is considerable depth of water in portions of a somewhat polluted pond or river, and the ice is formed in these portions in comparatively quiet water, with but little matter in suspension, this ice will probably be entirely satisfactory for domestic use, although considerable drainage may enter the body of water upon which it forms. On the other hand, ice formed in shallow portions of such ponds or rivers, even during still weather, or in any portion if there is considerable movement of the water by currents or wind while it is forming, may be rendered by these conditions entirely unfit for domestic use. The instances, however, where the pollution of an ice supply is known to have caused disease, are exceedingly rare. Lawrence is supplied very largely from ice cut from the Merrimac river, and yet since the construction of the city filter, the typhoid death-rate has been very low, owing to the excellent quality of the city water. In former years, moreover, the epidemics of typhoid fever occurred during the winter, rather than in summer when the consumption of ice is greatest. LEONARD P. KINNICUTT.

These conclusions are decidedly different from the statements made by the Massachusetts State Board of Health in their Twenty-first Annual Report (1889), pp. 145–153, so often quoted, and are much more in accordance with the generally accepted opinion on the subject. LEONARD P. KINNICUTT.

The Sanitary Protection of the Water Supply of Baltimore, Md. ALFRED M. QUICK, Water Engineer, Baltimore. *Eng. News*, 1901 (46), 431.—A statement of the general laws of the State Board of Health, of Maryland, relating to the pollution of public water supplies, and details of the plan pursued at Baltimore, for the systematic inspection of the water-sheds of the two streams used as a water supply. LEONARD P. KINNICUTT.

Annual Meeting of the New Jersey Sanitary Association, Lakewood, New Jersey, December 6 and 7, 1901. *Eng. News*, 1901 (46), 450.—Papers were presented on the following subjects: "Legal and Sanitary Status of Garbage Disposal in New Jersey"; "The Public Water Supplies of New Jersey"; "The Sanitary Aspects of the Reclamation of Meadow Land"; "The Drainage of Marsh Lands in Belmont and Cambridge, Massachusetts." Mr. H. N. Baker stated, in regard to garbage disposal, that only three towns out of fifty-seven, in New Jersey, had improved methods. Atlantic City, Camden, and Trenton have garbage crematories, while at Paterson a private company treats the garbage by a partial system of reduction. Mr. Herbert Baldwin, city chemist of Newark, in his paper on "Public Water Supplies," showed that in few, if any, of the states of the Union, have so much attention been paid to this subject, as in New Jer-

Digitized by Google

sey. He stated that there are at the present time, in New Jersey, eight mechanical and three slow sand filtration plants, and a new mechanical filtration plant is being built at Little Falls. In 1900, the death-rate from typhoid fever in New Jersey was only 19 in 100,000, while in Massachusetts, during the same year, it was 22.

LEONARD P. KINNICUTT.

The Pollution of Streams by Manufactural Wastes and Methods of Prevention. BY H. W. CLARK, Chemist, State Board of Health of Massachusetts. *Journal of the New England Water Works Association*, 1901 (15), 500–513.—The paper gives the results obtained at the Lawrence Experiment Station in treating sewage containing manufactural waste. Experiments were made with the waste liquor from woolen mills, tanneries, paper mills, and silk mills.

Woolen Mills.—The liquor from wool washing often contains 2500 parts of solid matter in 100,000 parts. It is impossible to cause this liquid to nitrify when passing through intermittent sand filters, but it was found that if the volume of domestic sewage was very large in comparison with the volume of waste liquor, nitrification would occur and good results be obtained with intermittent filtration.

Two sets of experiments on experimental filters, in one of which the mixed sewage was passed through a septic tank, were tried. Both gave good purification when the dilution was as one to twelve, but the filter receiving the septic sewage gave the better results and was freer from clogging at the end of the experiment. Attempts were made to treat wool liquor with chemicals, and though different precipitants were tried and in large amounts, the results were unsatisfactory.

Tanneries.—The waste liquor from tanneries contains, besides other substances, germicides as arsenic. Experiments showed that while this sewage would not nitrify in sand filters if applied directly, yet if it was passed through a coke strainer or over iron filings, the resultant liquor would be of such a character that it could be easily purified at the rate of 100,000 gallons per acre on intermittent filtration beds.

Paper Mills.—Waste from paper mills contains a large amount of cellulose and a small amount of easily decomposable nitrogenous substances. If such liquors are passed through a coke or cinder strainer at rates even as high as 1,000,000 gallons per acre daily, the resultant liquor is of fairly good quality.

Silk Mills.—Waste from silk mills contains, besides various dyestuffs and silk gum, a large amount of various chemicals. This liquor quickly clogs the surface of a filter-bed. Experiments showed that these clogging matters could be removed by use of a septic tank or by a coke strainer, or by a contact bed. The coke strainer removed 75 per cent., the septic tank 50 per

Digitized by Google

cent., and the contact bed 40 per cent. of the clogging substance.

In the printed discussion following the paper, Dr. Kinnicutt states that while he agrees in the main with Mr. Clark, that almost all kinds of trade waste can be purified if sufficiently diluted with domestic sewage, it is often very difficult, if not impossible, to obtain good effluents by bacterial methods alone, when manufacturing waste in very large quantities enters the sewers and mentions the failure at Bradford, England, where the sewage contains 400 parts of grease per 100,000 parts.

He also calls attention to the fact that in England, where more attention has been paid to this subject than elsewhere, and where manufacturers are very often obliged to treat their waste liquor before allowing them to enter the sewers, the usual method is to precipitate out, by the use of chemicals, a large amount of the suspended matter, as a preliminary treatment to bacterial purification. LEONARD P. KINNICUTT.

The Work of Sanitary Inspection on the Metropolitan Works. BY WILLIAM W. LOCKE. *Journal of the New England Works Association*, 1901 (15), 483–493.—The author gives a brief account of the New Haven typhoid fever epidemic of April, 1901, which was caused by the feces from three cases of typhoid fever (occurring in the remote limits of a town eight miles from New Haven) being washed, during a freshet, into a stream connecting directly with Dawson Lake, an important reservoir of the New Haven Water Company. He points out the dangers constantly menacing the health of cities and towns through the pollution of the streams and brook emptying into impounded reservoirs, states the rules and regulations made by the Massachusetts State Board of Health for the sanitary protection of waters used for the supply of the Metropolitan District, and how the water-shed of this district is guarded by the constant inspection of the sanitary inspector and his assistant. LEONARD P. KINNICUTT.

Experimental Septic Tanks at Ithaca, N. Y. ABSTRACT OF GRADUATION THESIS BY R. B. WILLIAMS. *Eng. Record*, 1902 (45), 31–32.—Five experimental septic tanks, 10 feet long, 1 foot 10 inches wide, and 7 feet deep, connected with five intermittent filtration beds, each $^1/_{5000}$ acre superficial area, were constructed to compare the results of allowing the sewage to run at different rates through the septic tanks. Owing to the limited time left for investigation, after septic action had reached an active state in the tanks, the experimental results are not very conclusive or of much relative value. The general conclusions were that, if the time of passage of the sewage through the tank was less than two hours, practically no septic action took place, and the tank acted only as a settling basin, filling rapidly with sludge; that with a time of passage greater than twenty-four

Digitized by Google

hours, the growth of toxins, poisonous to the aërobic bacteria acting in the contact beds, is encouraged. The minimum bacterial efficiency seemed to point to a four- or five-hour rate of flow; namely, the smallest number of bacteria, found in the tank effluents, was in the effluent when the rate of flow of the sewage through the septic tank was from four to five hours; the greatest number where the flow was twenty-four hours. No determinations of albuminoid ammonia seem to have been made. Experiments were also made with a small Scott-Moncrieff filter, with seemingly satisfactory results. LEONARD P. KINNICUTT.

Septic Tank and Contact Beds at Plainfield, New Jersey. BY ANDREW J. GAVETT. *Eng. Record*, 1901 (44), 471–472.—Plainfield, with a population of 16,000, has a double system of sewerage, constructed in 1895, one set of sewers being used for storm water, the other for sewage, which discharges upon intermittent sand filtration beds. In 1900 it became necessary to enlarge the precipitation plant, and the feeling against adding more sand filtration beds was so pronounced that the English system of septic tanks and double contact beds was recommended.

The plant which is now approaching completion consists of two closed septic tanks, side by side under one roof, and a double set of bacterial contact beds. The septic tanks are about 50 × 100 feet each, and 7 feet deep, the sewage rising 6 feet above the bottom. The contact beds are in two sets of four each, the first set 5.42 feet higher than the second; each bed is 92 × 106 feet and 5 feet deep. The construction is very light, the floor of cement concrete being only 5 inches, and the walls, except the center walls, only 1 inch thick. The outer walls are supported on one side by the filling material in the beds, on the other side by earth embankments. On the concrete floor of each bed fourteen lines of 4-inch horseshoe tiles are laid, radiating from the gate chambers, and coarse stone is spread between and over them to a depth of 6 inches; above this is placed the working material of the beds, $3^1/_2$ feet in depth and above this a foot of coarse stone to serve as a roof. The filling material in the upper beds is trap rock, varying in size from $^1/_4$ to $1^1/_2$ inches; and in the lower beds, slag is used in some beds, cinders in others, somewhat smaller in size than the stone in the upper beds. In the top foot of coarse stone the distributing pipes are laid.

At the present time the ordinary flow of sewage is half a million gallons in twenty-four hours. It is intended that the sewage shall flow from the gate house to a small influent chamber, where it may be diverted to either tank by a wooden gate. The sewage, after passing at a slow rate through the septic tank, is to be aërated by passing over a weir in a thin sheet, and by falling into

Digitized by Google

a channel extending the full length of each tank, 100 feet in all. The sewage, after passing through the channel, is to be diverted to each of the four upper beds in succession, The sewage, after being retained an hour or more in the upper beds, is to be drawn off by opening a sluice gate and run upon the second set of contact beds, where, after being retained for one or more hours, it is to be turned into the brook. Each bed is to be allowed to remain empty for one or more hours before each filling.

LEONARD P. KINNICUTT.

Expert's Report on Sewage Disposal for the Lower Passaic Valley. *Eng. News*, 1902 (47), 39–40.—Messrs. Rudolph Hering, J. J. R. Croes, and Wm. M. Brown, members of the American Society of Civil Engineers, submitted, on December 2, 1901, their report for the sewage disposal of Paterson, Passaic, and the intervening New Jersey towns.

The present population of these towns is about 500,000, and the plan proposed is to construct a trunk sewer of 15.7 miles from Paterson to Newark Bay. The sewer is to be 7 feet in diameter at Paterson, and 11½ feet at Newark Bay. In determining the dimensions of the sewer the experts assumed that its capacity should be such as to provide for conveying the sewage of the district until 1935, at which date the population contributing to it is estimated at 1,500,000. The quantity of domestic and factory wastes and ground water entering the river is estimated at 150 gallons per head of the population. The disposal of the sewage, even after partial purification, into Newark Bay is held to be impractical for more than a few years, owing to insufficient dilution and the slowness with which the sewage would flow out of the bay, and it is recommended that the outlet sewer be continued five miles across the bay, and into deep water in the upper part of New York Bay.

The total cost, exclusively of land, is estimated at $7,000,000. The only alternative, and one which is not recommended, is the erection of purification works on the Newark meadows, consisting of septic tanks and contact beds. The report in considering this method discusses the subject of purification by bacterial methods, especially the modern English system. The points they regard as still unsettled are: the likelihood of offensive odors; the length of time during which sewage should be subjected to septic action; the amount of sludge decomposed by the bacterial action in the tank; the best preparation of the tank effluent for contact beds; the rate at which the capacity of the contact bed diminishes, and the consequent necessity of removing the filling material and washing it with water. Judging, however, from recent English experience, they believe that if this method was employed, a plant must be built capable of treating 100,000,000 gal-

Digitized by Google

lons per day, which would require settling tanks for the deposition of the grosser mineral impurities held in suspension, septic tanks of at least 50,000,000 gallons capacity, and contact beds of broken stone of perhaps 167 acres in area, underdrained at the level of the highest tide.

The cost of such a disposal plant is approximately estimated at $4,500,000, which besides the settling basins, septic tanks, and contact beds, includes 300 acres of land and two sludge steamers to carry the sludge to sea. LEONARD P. KINNICUTT.

New Sewage Screening Apparatus, Manchester, England. *Eng. Rec.*, 1901 (44), 477–478.—The sewage of Manchester, especially in times of storm, contains large quantities of heavy detritus from the streets, and much floating matter, such as cotton waste, rags, and garbage of various sorts, which tend to interfere seriously with the best action of the septic tanks. A system of screens and catch-pits has therefore been devised and erected for the removal of this material as far as is possible, before the sewage enters the tanks. By means of this plant, which is considered as one of the most efficient that has been devised, 90 tons per week of solid matter are removed from the sewage in dry weather, and in time of storm as much as 50 tons has been removed in twenty-four hours. LEONARD P. KINNICUTT.

Sewage Disposal at Wauwatosa, Wisconsin. Septic Tank and Sand Filtration Beds. *Eng. Rec.*, 1901 (44), 565–566.—A small plant consisting of one septic tank and six sand filtration beds. The septic tank, built of concrete and covered by a brick building, is 50 feet long, 20 feet wide, and 10 feet deep, the sewage rising 8 feet from the bottom; capacity to the flow line, 44,650 cubic feet. It is divided into five compartments by wooden partitions, so arranged that the time required for the sewage to pass through the tank may be extended from six to twenty-four hours.

The sand filtration beds are six in number, 60 feet long, 30 feet wide, and contain 3 feet of filling material. The sewage, after passing through the septic tank, runs into a controlling chamber, 12 × 14 feet, containing six 10-inch Miller's automatic flushing siphons so arranged that each discharges through a 12-inch sewer pipe on to a separate sand filter-bed.

LEONARD P. KINNICUTT.

The New Drainage and Sewerage System of New Orleans. BY FREDERICK MOORE. *Scientific American*, 1901, pp. 364–365.—The drainage system taking the rainfall, which amounts to from 5 to 6 feet annually with often a daily rainfall of 4 to 6 inches and a fall for a few minutes at the rate of 6 inches an hour, is to be carried into Lake Pontchartrain. The sewage proper, 20,000,000 gallons per day, is to be, as a

Digitized by Google

rule, raised by pumping and discharged into the river below the city. At times when the volume of sewage is so great that its total disposition in this direction is economically impracticable, and as at such times, from its extreme dilution, the water is practically unobjectionable, the overflow is to be discharged at three different points into Lake Pontchartrain.

LEONARD P. KINNICUTT.

Garbage Collection, Removal and Final Disposal at Milwaukee, Wis. *Eng. News*, 1902 (47), 63–64.—After many years of agitation, conflict and litigation, Milwaukee has just completed a garbage disposal plant. It consists of three furnaces, 33 feet by 17½ feet, built by the Engler Sanitary and Cremation Co. Each furnace consists of two chambers, side by side, connected above by arched openings, one chamber being slightly lower than the other. The upper one is the drying chamber, the lower one the burning chamber. Each furnace has a capacity for burning 50 tons of garbage a day, and as the present amount collected is about 100–110 tons, two furnaces will meet the present requirements, leaving the third as a reserve. A fourth furnace can be put in when the growth of the city requires it. The total cost of plant, including chimney, furnaces, building, garbage boats, hoists, patent rights, but not including land, is estimated at $75,000. LEONARD P. KINNICUTT.

The New Garbage Reduction Works at Buffalo, N. Y. *Eng. News*, 1901 (46), 480.—Amount of garbage, about 750 tons per week. The garbage is delivered at the works in wagons which have a capacity of 4–5 tons each. The garbage is placed in driers, 18 now in use, giving a daily capacity of 150 tons, and 6 more are to be added next year. After being dried the garbage is treated in extractors, of which there are four, with naphtha, according to the Merg system. Grease separators and condensers are used for separating the grease from the naphtha, the grease being barreled as it comes from the separator. It is intended to dry, grind, and sift the tankage, and sell it as a fertilizer base.

LEONARD P. KINNICUTT.

Heating and Ventilating Hospitals for Contagious Diseases. By THOMAS BARWICK. Meeting of the American Society of Heating and Ventilating Engineers, New York City, January, 1902. *Eng. Record*, 1902 (45), 109.—In this paper the author recommends that the velocity of the air entering the rooms should be limited to 250 feet per minute, that the whole system, not including the auxiliary or repeater stacks, should be proportioned to maintain the building at 70°–75° under all conditions of weather and with reheaters at 80°–85°, and that the air supply should be 5,000 to 6,000 cubic feet of air per hour per occupant. As regards the vitiated air, it should be collected into a receiving

Digitized by Google

chamber, and passed through a disinfector, in which the germs should be killed by heating the air, or by passing live steam into the chamber, or by passing the air through a disinfecting tank.

LEONARD P. KINNICUTT.

Selenium. Possible connection of the presence of selenium with the poisoning caused by drinking beer in the north of England in the autumn of 1900. *Scientific American Supplement*, Nov. 2, 1901, pp. 29,604–29,605.—Selenium has been shown by Chabree and Lapugus to be an irritant poison, and its presence was detected in many of the beers analyzed. This has given rise to an opinion that selenium may have been, as well as the arsenic, a factor in many of the cases of illness that were caused by the use of these beers. LEONARD P. KINNICUTT.

INDUSTRIAL CHEMISTRY.

Tests of Beaumont Oil as Fuel. BY J. E. DENTON. *Eng. and Min. J.*, Feb. 1, 1902.—Professor Jas. E. Denton, of Stevens Institute of Technology, has published the results of elaborate comparative tests as to the fuel value of crude Beaumont oil and anthracite coal of buckwheat size. The oil burner used was the Williams oil burner, furnished by the International Gas and Fuel Co., of Chicago. From the several tables of results by Professor Denton, the following figures are selected. For producing horse-power upon the commonly guaranteed basis of one H. P. per 10 square feet of heating surface and with an average percentage of moisture and ash in the coal:

Moisture in the coal	3 per cent.
Ash	17 "
Evaporation per lb. of wet coal from and at 212°	8.75 lbs.
Net evaporation per lb. of oil from and at 212°	14.8 "
Number of barrels of oil equivalent to 2240 lbs. of coal	4.12
Price of coal per 2240 lb. ton without cartage and cost of ash removal	$3.00
Equivalent price of oil per barrel of 42 U. S. gallons	0.73

WATER.

	Oil.	Coal.
Total weight of water fed to boiler, lbs	70798	41717
Factor of evaporation	1.180	1.182
Equivalent water evaporated with dry steam from and at 212°	83542	49309

ECONOMIC RESULTS.

Feed water per lb. of fuel as fired, lbs	13.13	7.56
Equivalent evaporation from and at 212° per lb. of fuel, lbs	15.49	8.94
Equivalent evaporation from and at 212° per lb. of combustible, lbs	15.49	11.79

Digitized by Google

HORSE-POWER.

Horse-power at 34.5 lbs. from and at 212°	220.1	119.1
Heating surface per horse-power, sq. ft	8.45	15.6

ANALYSIS OF THE BEAUMONT OIL.

Specific gravity	0.920
Flashing-point	142° F.
Burning-point	181° F.
Cold test	—6° F.
Calorific value per lb. by oxygen calorimeter	19060 B. T. U.

Chemical composition by ultimate analysis:

Carbon	84.60 per cent.
Hydrogen	10.90 "
Sulphur	1.63 "
Nitrogen	0.00 "
Oxygen	2.87 "

S. P. SADTLER.

Ratio of Results in Coal- and Oil-Burning. BY GEORGE T. ZIMMERLE. *Age of Steel*, Jan. 11th.—The author gives the results of a comparative test, based upon the consumption of 10,000 lbs. of coal, at $3.15 per ton and 20.66 bbls. of oil, at 59 cents per bbl., which showed a saving of $3.56 in favor of the oil. The difference in the amount of water evaporated per pound of fuel was 4.19 lbs., in favor of the oil, the temperature of the feed water being 90° and the steam pressure 110 lbs. The author says that many accounts of comparative tests are unreliable, as they are not fair from one standpoint or another. With the better regulation of the air in the use of oil 16 lbs. of water evaporated should be obtained, which would be equal to a ton of coal at $2.10, the oil selling at 59 cents. If a regenerative system were used, in which a portion of the evaporated steam were heated by the escaping gases to form a water-gas, the oxygen burning with the oil and the hydrogen availed of as an additional heat producer, the evaporation could probably be brought up to 20 lbs., and this would make the oil at 59 cents a bbl. equal to coal at $1.37½ a ton. [Such a result is impossible, as the full theoretical evaporative effect is only about 20 lbs. of water per lb. of oil. W. A. N.]

S. P. SADTLER.

Oil Fuel for Locomotives. BY H. B. GREGG. *Amer. Engineer*, January. In this article, which is a continuation of the subject presented in the previous number of the same paper (see *this Journal, R.*, p. 95), the author exhaustively compares coal and oil (both California and Texas oil), and gives numerous tables of results with different engines, both passenger and freight. In one of these tables, he gives the average consumption of oil as 0.1586 lbs. per ton-mile and coal 0.3557 per ton-mile. Comparing the two varieties of oil mentioned, he finds the average results were almost exactly the same. S. P. SADTLER.

Digitized by Google

The Trans-Caucasian Pipe Line. VICE CONSUL-GENERAL MURPHY, Frankfort. *U. S. Consular Report*, January, 1902, p. 45.—While in 1900 Russia supplied to the markets of the world, 35 per cent. of all the petroleum offered, or 365,000,000 gallons out of 1,035,000,000 gallons, it was because of the lack of transportation facilities from Baku to Batoum, the shipping port, all the petroleum having to be sent by tank cars. When the pipe line, now under construction, is finished, the price of transportation will be cut down from 2 cents per 5 gallons to 0.6 cent., and the capacity will be raised to 625,000,000 gallons per annum, so that Russian oil will be a strong competitor with the United States. S. P. SADTLER.

Approximate Production of Beet-Sugar in 1901. BY HENRY W. DIEDERICH, Bremen. *U. S. Consular Report*, January, 1902, p. 84.—Consul Diederich estimates that the beet-sugar output of the world this year will be 6,600,000 tons, and states that this taken with the fact that Cuba reports an increase over former years makes it likely that there will be an abundance if not a surplus of sugar. He believes that this will lead to legislation looking towards the abolition of sugar bounties. Consul Mason, writing in the same number of the report, corroborates this statement. S. P. SADTLER.

The Sugar Question in Europe. YVES GUYOT. *North American Review*, January.—The entire sugar industry is the recipient of a system of bounties. This is either in the form of an abatement of taxation or a definite remuneration according to the amount of production. Thus, in France, it is an avowed indirect system of payment; in Belgium and Russia a disguised indirect system; in Germany and Austria, a direct system of payment. The direct system of payment has also been in use in France since 1897. By the law of 1884, in France, the tax was assessed on less than the annual production; by the law of 1897, a large portion of the tax paid in the refining is refunded. In Austria, bounties on exportation are allowed to the limit of 9,000,000 florins. In Germany there exists a tax on the manufacture, a limitation of the total production of factories at a certain degree of taxation, and a bounty on exportation. In both Germany and Austria, the sugar industries are combined in the hands of a trust. In Russia each factory is assigned a certain production and when they produce in excess of this, they are allowed a lesser rate of taxation and are compelled to export. S. P. SADTLER.

The Relative Progress of the Coal-Tar Industry in England and Germany in the Past Fifteen years. BY ARTHUR C. GREEN. *Science*, January 3, 1902. (From a paper read before the British Association at Glasgow, 1901).—Preeminence in the coal-tar industry signifies preeminence in those industries also re-

Digitized by Google

quiring less scientific knowledge. This is exemplified by the necessity of the color industry to obtain sulphur trioxide, and the resulting perfection of the contact process for its manufacture and the availability of this, and concentrated sulphuric acid for other industries. The color industry has also given birth to, and fostered the manufacture of synthetic medicinal agents, artificial perfumes, sweetening materials, antitoxins, nutritives, photographic developers, etc., and led to the designing of innumerable forms of chemical apparatus. Comparing the prestige of Germany in the coal tar industry with that of England we can see how thoroughly Germany has controlled the situation.

The exports of coal tar colors by Germany in 1899, had a value of £3,500,000. The exports of coal-tar colors by England in 1899, had a value of £366,500. During the last fifteen years German firms have taken out 948 completed patents for coal-tar products, while English firms have taken out in the same time 86 patents. The main reasons given for this notable difference are England's lack of resource in dealing with her coal-tar and the lesser appreciation on her part for pure science.

S. P. SADTLER.

Some Rudimentary Considerations Concerning the Treatment of Water for Locomotive Use. BY R. P. C. SANDERSON. *Am. Engineer*, January.—The author makes a plea for more careful examination of waters by railroad division superintendents and others charged with the supervision of roads. He speaks not only of the calcium and magnesium salts which cause hardness but of the sodium and magnesium salts which cause foaming and corrosion of the boilers. He says that in many cases the adding of carbonate of soda and phosphate of soda, causes nearly as much trouble as the salts they are to decompose. He says that good results are often obtained by adding tannin bark extracts, gums, and certain oils which act to keep the precipitated particles apart in a kind of sludge. S. P. SADTLER.

German Artificial Clay. BY CONSUL-GENERAL R. GUENTHER. *U. S. Consular Report*, February, 1902.—Artificial clay, according to German papers, is receiving increased attention abroad. This material, which is used for the manufacture of artificial stone, tile, gutters, etc., is composed of sand, chalk, cement, liquid glue, and petroleum. The substances are mixed in certain quantities and a clay-like mass results, which can be formed at pleasure, and acquires an excellent degree of hardness by being subjected to heat. The artificial clay can be employed in a variety of structures: tiles of different forms and sizes are made of it. They have a perfectly even surface and sharp edges, are fire-proof and resist the influences of the weather; they furthermore absorb no moisture. The clay is also used for the manufacture of artificial stone in all colors. Tests with this clay have been made at the

Digitized by Google

laboratory of the Technical Experimental Station at Charlottenburg, and the results have been pronounced very favorable. As the substances are easily mixed without the aid of machinery, the smallest builder can use the process and so obtain the structural decorations at a low price. S. P. SADTLER.

The Coefficient of Expansion of Concrete. BY WM. D. PENCE. *Eng. News*, **46**, 380–382.—The apparatus by means of which the coefficients of expansion of several grades of concrete were determined is described in detail. One grade, the coefficient of which was found to be 0.0000054, was composed of 1 part of Lehigh Portland cement, 2 parts of sand, and 4 parts of hand-broken oölitic limestone. A second grade was composed of Medusa cement, sand, and crushed Kankakee, Ill., limestone mixed in the proportion above stated, and the coefficient in this case was 0.0000056. The coefficient of gravel concrete of 1 : 2 : 4 (or 1 : 5) proportions, using either Lehigh or Medusa cement, averaged 0.0000054. The Fahrenheit scale was used.
C. J. MOORE.

Cement for a Modern Street. BY S. F. PECKHAM. *Pop. Sci. Monthly*, **60**, 145–157.—There is a considerable variation in the kind of mortar used in the concrete foundations of modern streets. The principal cementing materials which have been used for this purpose, and which are discussed in this paper, are ordinary lime mortar, Roman cement, natural or Rosendale cement, and Portland cement. The first two are practically of little value in this connection, and of the last two the Portland cement is generally far superior. The process of manufacturing Portland cement, as carried out by the Virginia Portland Cement Co., is given in detail. The works of the Milwaukee Cement Co., manufacturers of natural cement, are described and illustrated. C. J. MOORE.

Two Recent Systems for Burning Powdered Coal. *Eng. News*, **46**, 415–416.—The two devices described and illustrated are the Cyclone and Aero pulverizer systems. In the former the coal is ground by attrition between the arms of a rapidly revolving star, and the serrated sides of a steel casing. The coal dust is driven into the combustion chamber by means of a separate fan. In the Aero-pulverizer system there are four communicating chambers through which the material passes successively. The first three chambers contain revolving paddles, which pulverize the coal to any desired degree of fineness. A fan, located in the fourth chamber, causes a current of air to pass through the other chambers, drawing with it the coal dust, and finally driving it into the furnace. Many advantages are claimed for both systems.
C. J. MOORE.

Digitized by Google

Enameling. *Sci. Am. Sup.*, **52**, 21,616–21,617.—This article is confined to the commercial enameling industry, with special reference to sign-board enameling. The successive steps in the process and a list of the materials used are given. The first three of the twelve steps are discussed in detail.

C. J. MOORE.

Enameling. *Sci. Am. Sup.*, **52**, 21,636–21,637.—The author divides enamel constituents into four groups: fundamental media, flux media, decolorant media, and coloring media. The first three have been discussed in previous papers, and it is the fourth which is dealt with in this article. German and English methods are compared, and the author believes that the laboratory experimental work, considered so important by the Germans and neglected by the English, is of great value. Sign tablet and hollow-ware enameling are also compared. The copper enameling process is described, special reference being made to the way in which it is carried out in Japan. C. J. MOORE.

Two English Boiler Feed-Water Softeners. *Am. Electrician*, **13**, 576–577.—Both of these purifiers, the Desrumaux and the Beissel, are automatic. They differ from each other and from the purifier used at Buda, Ill., by the Chicago, Burlington and Quincy Railroad, only in mechanical details. After the water has been mixed with the proper amounts of lime water and soda, it enters the top of a tall central cylinder through which it passes and issues from the bottom into a large outer cylinder. It is then forced to rise, in the Desrumaux system, through a number of convolutions of sheet metal upon which the precipitated solids settle and gradually slide down to the bottom, and are drawn off from time to time. Funnel-shaped divison planes, instead of convolutions, characterize the Beissel type. Both forms are said to be very efficient. C. J. MOORE.

On the Use of Zinc in Boilers. BY R. A. DOUGLASS. *Am. Electrician*, **13**, 572–573.—Water in certain localities contains substances which corrode iron quite rapidly. It has been discovered that if pieces of zinc are suspended below the water line in boilers and connected by copper wire with the boiler plates, the corrosive agents attack the zinc and the action on the iron is greatly lessened. It is commonly supposed that the action is of an electrical nature, though certainly not altogether so. It is suggested that in many cases, if the water is made alkaline with soda ash, the same result is accomplished, and the trouble is much less. Zinc does not affect in any marked degree the deposition of calcium and magnesium salts, which form incrustations in boilers. C. J. MOORE.

Reversible Galvanic Battery. *Elect. Rev.*, **39**, 633.—This battery has been patented by Edison. Numerously perforated

Digitized by Google

plates of metallic magnesium are used as supports upon which zinc is electro-deposited from a saturated solution of zinc hydroxide in a 20 per cent. solution of caustic soda. The negative element is the red oxide of copper, held in receptacles of nickel, attached to nickel plates. Finely divided copper is molded in cakes and converted into the black oxide by heat. It is then reduced to the metallic state by electrolytic action. In charging the battery, the copper is converted into the red oxide and the zinc is deposited upon the magnesium electrode, the process being continued until 75 per cent. of the zinc has been thus deposited. When the battery is discharged, the reverse operation takes place. C. J. MOORE.

AGRICULTURAL CHEMISTRY.

Fertilizing Value of Oil Cake. BY MALPEAUX. *Sci. Am. Supplement*, 53, p. 21,822.—The average results of experiments covering two years indicated that sesame, poppy, castor-bean, cameline, colza, rape, cottonseed, arachis, and palm-nut cakes rank in the order mentioned as regards fertilizing value. The action of sesame, poppy, castor-bean, and cameline was much more prompt than that of colza, rape, arachis, and cottonseed, indicating that the former might well be used for spring, and the latter for fall sowing. In the case of sugar beets the application of oil cake in the winter was very advantageous. The application of the slower-acting oil cakes at the time of sowing is considered of little advantage, especially in a dry season. The residual effect of the oil cakes was marked, especially when the application was made late during the first season. H. W. LAWSON.

Employment of Chemical Products for the Destruction of Weeds. BY NAISER. *Sci. Am. Supplement*, 53, p. 21, 823.—Sea salt, mineral oil, iron sulphate, and copper sulphate are noted as having been shown by experiments to be effective in the destruction of weeds. Of these substances, iron sulphate is considered the cheapest and best. The addition of a small quantity of sodium nitrate to the iron sulphate is considered generally advisable. From 5 to 25 kilos of iron sulphate are dissolved in a hectoliter of water and 5 or 6 hectoliters are applied per hectare.
H. W. LAWSON.

Electricity and Plant Life. BY VON GEORG HEBER. *Abs. in Western Electrician*, 30, (No. 4), p. 59.—Different methods of using the electric current for stimulating plant growth are noted and the results of experiments along this line are given. Not much importance was attached to the results of experiments in subjecting seeds to the influence of electricity for some time previous to planting. In experiments with carrots, beets, wheat, rye, oats, and barley the soil in which the plants were grown was

Digitized by Google

traversed by a current from a battery of several cells in series. The current was applied only at night time and was reversed at intervals of a few days. In every case electricity stimulated both the root and leaf development of the plants as compared with control cultures, the most marked difference being observed in the case of beets. Lupines, grown between plates of zinc and carbon sunk in the soil and connected above ground, made a much better development than plants grown without the influence of electricity. Unsatisfactory results were obtained with alternating currents from induction coils. It is stated in summing up that when properly applied electricity produces a favorable action on the growth of plants. H. W. LAWSON.

Alkali Lakes and Deposits. By W. C. KNIGHT AND E. E. SLOSSON. *Wyo. Agr. Expt. Sta. Bull.*, No. 49, pp. 69–123.—The nature and origin of alkali are discussed and eight groups of alkali deposits, or "soda lakes," located in the southeastern part of Wyoming, are described. Analyses of a large number of samples which are reported show great variation in the composition of the different deposits. Sodium sulphate and magnesium sulphate were the principal salts found. H. W. LAWSON.

Soil Survey around Imperial, California. By T. H. MEANS AND J. G. HOLMES. *U. S. Dept. Agr., Bureau of Soils, Circ.*, No. 9, pp. 1–20.—This is issued as a preliminary circular, giving the results of a soil survey of about 169 square miles of the Colorado desert, in the extreme southern portion of California. Of the area surveyed it is believed that 49 per cent., which contains less than 0.4 per cent. of alkali in 6 feet of soil, can be farmed to ordinary crops with proper irrigation, cultivation, and in some cases underdrainage. Only the more alkali-resistant crops, such as date palms, sorghum, and sugar beets, are considered suitable for the remainder of the area, portions of which, however, are too rough for profitable cultivation. An account is given of the topography of the area, the system of irrigation, and the water supply. Five types of soil designated dune sand, Imperial sand, Imperial sandy loam, Imperial loam, and Imperial clay, are described. The composition of the alkali of the region as determined in a mixture of 8 samples of alkali crust was calcium sulphate 9.91, magnesium sulphate 9.02, sodium sulphate 0.33, potassium chloride 30.02, sodium bicarbonate 9.59, sodium nitrate 8.91, and sodium chloride, 32.22 per cent. A table shows the amount of alkali in each foot of soil to a depth of 6 feet at 119 localities. Over 11 per cent. of the area contained more than 1 per cent. of alkali. Borings to a depth of 18 feet showed a high percentage of alkali in the subsoil. H. W. LAWSON.

Effects of Renewing the Humus in Continuous Corn Culture. By W. C. LATTA. *Ind. Agr. Expt. Sta. Rep.*, 1901, pp. 22–25.—

Digitized by Google

In plat experiments with corn from 1894 to 1900, the humus in the soil was renewed by returning the corn stover produced, by applying an equal weight of wheat straw, or by using crimson clover as a green manure, the results as a whole being considered as indicating clearly the wisdom of such treatment. As compared with the three years preceding the experiments, the yield of corn during the last three years was increased about 40 per cent. by returning the corn stover and about 18 per cent. by applying wheat straw or plowing under clover. H. W. LAWSON.

Indoor Tomato Culture with Chemical Fertilizers. BY W. STUART. *Ind. Agr. Expt. Sta. Rep.*, 1901, pp. 26–50.—Pot and bench experiments were conducted with several varieties of tomatoes to determine the elements of plant food necessary to the production of a maximum amount of fruit. In the bench experiments the greatest increase was obtained by the use of a mixture of nitrate of soda, acid phosphate, and muriate of potash. In the pot experiments the addition of nitrate of soda increased the yield 16 per cent. over the control pot; raw bone meal, 32 per cent.; nitrate of soda and muriate of potash, 35 per cent.; nitrate of soda and acid phosphate, 70 per cent.; and nitrate of soda, muriate of potash, and acid phosphate, 325 per cent. The substitution of raw bone meal for acid phosphate increased the yield and the substitution of sulphate of potash for muriate of potash decreased the yield. H. W. LAWSON.

The Service of Soils. BY F. A. HUNTLEY. *Idaho Agr. Expt. Sta. Bull. No.* 30, pp. 39–51.—Brief notes are given on the physical condition of soils as affecting plant growth and experiments with different crops designed in part to show the value of increasing the amount of humus in the soil are reported. Analyses of soil from an unfertilized plat, and from a plat which had been fertilized three years previously with barnyard manure are republished from an earlier bulletin of the station, and analyses are given of two varieties of sugar beets grown on the two plats. The sugar content of the beets was slightly lower on the fertilized plat, but the yield of beets was very much greater. H. W. LAWSON.

The Sugar Beet in Indiana. BY H. A. HUSTON. *Ind. Agr. Expt. Sta. Rep.*, 1901, pp. 89–106.—This article summarizes the work with sugar beets in Indiana from 1888 to 1900. The author points out that all the conditions necessary for the successful establishment of the beet-sugar industry are found in northern Indiana, and in portions of the central part of the state. The results are averaged by counties, the number of samples of sugar beets analyzed, the number of years in which the samples were obtained, the average sugar content of the juice, and the coefficient of purity being given, together with notes on the suitability of each county for sugar-beet culture. H. W. LAWSON.

Digitized by Google

PATENTS.

SEPTEMBER 3, 1901.

682,140. Richard J. Friswell, London, England. Manufacture of **refractory materials.** Deposits colloidal silica in asbestos, chalk and similar substance by saturating them with sodium silicate, and then acting on them with moist carbon dioxide in a closed chamber, then washing out the sodium carbonate thoroughly. May use furnace gases for carbon dioxide.

SEPTEMBER 10, 1901.

682,181. Georg Eichelbaum, Berlin, Germany. Assignor to Farbenfabriken of Elberfeld Co., New York, N. Y. Process of producing **albumoses,** from albumen in which the formation of peptones is practically prevented by heating albumen in closed vessels with a 5 per cent. solution of bisulphite of lime at 90° to 100° C., removing the acid contained in the reaction mixtures, and separating the albumoses from the liquids thus obtained.

682,249. Adolph Frank, Charlottenburg, Germany. The **process of making carbon,** which consists in reacting on a hydrocarbon as acetylene or a carbide of the metals of the alkalies or alkaline earths, with an oxide of carbon. A fine carbon black suitable for india ink, is obtained.

682,310. Richard Zsigmondy, Iena, Germany. Process of producing **coatings of metallic luster on ceramic objects,** etc., by applying to the objects an argentiferous organic fluid containing silver, 7; bismuth oxide, 3; and gold from 0.45 to 1 part; the total of precious metal being less than 7 per cent., then heating the objects to between 340° and 380° C.

682,311. Sylvester Zuckschwerdt, Leopoldshall, Germany. Making **cyanides.** Heats carbon and alkali in presence of ammonia, first impregnating the carbon with alkali by steaming and boiling in a suitable alkaline liquid, thus removing the gases, and saturating the carbon with a strong solution of alkali with continuous circulation till all the water of the carbon is replaced by the alkaline lye, which fills the pores of the carbon.

682,326. Julius Hofmeier, Vienna, Austria-Hungary. Making an **adhesive** from blood fibrin, for glueing, etc., by evaporating to dryness an alkaline solution of blood fibrin, dissolving the residue in warm water and treating the solution with a coagulating agent as chromic alum, etc.

682,363. Charles S. Lawrence, Plainfield, Wis. Assignor of one-half to Frank McConic, Friendship, Wis. **Wood preserving compound.** Sodium chloride, 16; arsenious acid, 8; bichloride of mercury, 1; potassium nitrate, 2; subacetate of copper, 1; parts by weight.

Digitized by Google

682,382. John W. Gray, Oakland, Cal. **Liquid balance.** For determining weight volumes, etc., a hollow tube adapted to receive a liquid to rise in the tube when the subject to be weighed is placed within the latter, means for causing the tube to float erect in liquid, and graduations to determine depth of flotation and rise of liquid in tube.

682,494. Frederick A. Reichman and A. Lagerquist, Varberg, Sweden. Process of **mercerizing** short staple cotton. A silky luster is obtained by soaking and boiling in concentrated alkali till free from grease or fat, then treating it under tension with concentrated caustic soda lye and copper oxide ammonia till it is dark blue, then washing, neutralizing, and finally allowing it to lie in highly concentrated nitric acid till it is of a pale yellow color, when it is squeezed and washed.

682,510. Walter Voigtlander-Tetzner, Ludwigshafen, Germany. Assignor to Badische Anilin und Soda Fabrik, same place. **Blue disazo dye,** from tetrazotized dianisidin, 2-phenylamino-5-naphthol-7-sulpho acid and 1,8-aminonaphtholsulpho acid, soluble in wate blue, giving a violet precipitate with hydrochloric acid or caustic soda, soluble in concentrated sulphuric acid blue-green, yielding a brown-red vat on reduction with zinc and caustic soda lye.

682,521. Henry S. Blackmore, Mt. Vernon, N. Y. Process of **generating acetylene gas.** Performs a double reaction between an extraneously heated carbide and a dry hydrogen acid, the hydrogen of which has a greater affinity for the carbon of the carbide than it has for the acid constituent with which it is combined in the presence of said carbide. May use hydrogen sulphide.

682,523. Rene Bohn, Mannheim, Germany. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. **Blue dye,** from *b*-aminoanthraquinone and caustic potash melted together and dissolved in water and aërated, unreduced it is insoluble in water and caustic soda, dissolves in concentrated sulphuric acid yellow-brown that by oxidation with chromic acid becomes a yellow substance that on reduction is reconverted into the original blue color.

682,549. John A. Just, Syracuse, N. Y. **Casein powder,** which is white, tasteless and odorless, of a loose fluffy and highly porous structure, lighter than water in which it dissolves readily and completely, forming a permanent and uniform opalescent solution, containing no casein compounds that are insoluble, and composed of casein and alkali.

682,569. Henry R. Riches, Cheshunt, England. Assignor to Wool, Hide and Skin Syndicate, Limited, same place. Process of **removing hair,** wool, fur, etc., from hides or skins. First washes, then breaks in moist condition, then while still moist,

Digitized by Google

treats with heated ammonia gas and heated aqueous vapor, then mechanically removes the hair.

682,572. Louis M. Schlarb, Allegheny, Pa. Assignor to the B. Gloekler Co., Pittsburg, Pa. Process of **curing meat,** by simultaneously injecting brine and carbonic acid under pressure, exhausting the internal air from the meat, subjecting the meat to the action of brine *in vacuo*, and finally subjecting the meat to the action of carbonic acid under pressure.

SEPTEMBER 17, 1901.

682,724. Henry J. Livingston, Baltimore, Md. Composition for strengthening **cements,** consisting of powdered carbon, soluble alkaline matter, soluble carbonaceous matter (saccharine or farinaceous), and water, evaporated to dryness and pulverized.

682,741. Johannes Pfleger, Frankfort-on-Main, Germany. Assignor to Deutsche Gold und Silber Scheide Anstalt, vorm. Roessler, same place. Making **cyanides** by reacting on ammonia with a mixture of alkali metal, carbon and a cyanide at a temperature not exceeding the melting-point of the cyanide, thereby forming dialkali cyanamide, then raising the temperature of the mass to about 750° to 800° C., thereby forming alkali cyanide.

682,794. Friedrich A. Gasch, Honningen on Rhine, Germany. Process of obtaining **zinc solutions free from iron and manganese** compounds. Treats zinciferous roasted pyrites with strong acid, roasts the resulting product and mixes it while hot with an oxidizing agent such as Chili saltpeter and lime, and then leaches the mixture.

682,815. Bishop Purcell, Portagebille, Mo. **Welding metals** by sprinkling powdered sulphur into the fire, then placing the metals in the fire and bringing them to a welding heat.

682,825. Friedrich Valentiner, Leipzig-Plagwitz, Germany. **Dressing hides** and tanning, with a fluorine compound of chromium hydroxide.

682,835. Frank J. Tesar, Chicago, Ill. **Polish for furniture.** Water, 60; washing soap, 4; spirits turpentine, 53½; wood alcohol, 7; parts by weight.

682,891. George Thomson, Elizabeth, N. J. Making **alloys of copper and manganese,** and of **iron and manganese,** by forming a molten mass of iron, copper, and manganese, preserving such mass in a fluid quiescent state till an alloy of part of the copper and manganese has settled to the bottom, and most of the iron with the rest of the copper and manganese has risen towards the top, separating the two portions, adding more iron to the upper portion (or steel), whereby manganese steel is made and the copper recovered by gravity separation.

683,000. Isaiah L. Roberts. Method of obtaining **aluminum hydroxide** by electrolysis, by treating aluminum compounds with

Digitized by Google

an alkali capable of dissolving said compounds, electrolyzing the solution on the anode side of a partition sufficiently porous to allow the passage of bodies under the action of the electric current, thereby precipitating aluminum hydroxide, and removing it.

SEPTEMBER 24, 1901.

683,014. Wilson B. Angstadt and Kilburn H. Cleaver, Reading, Pa. **Fertilizer.** Treats refuse animal and vegetable matter with hot sulphuric acid in excess, adds ground phosphate rock to take up excess of acid, and then a drier to absorb moisture, screens and grinds to powder.

683,089. Knut C. Wideen, Brooklyn, N. Y. **Reducing oxides** or other metallic compounds. Extracts aluminum by putting the oxide in a furnace and forming a vacuum therein, then closing it and raising it to a temperature greater than that of the oxyhydrogen blowpipe whereby the oxygen is separated from the aluminum.

683,116. Adam C. Girard, Paris, France. **Making explosives.** Forms a picrate of potassium in a suitable oil and adds nitronaphthalene and potassium perchlorate.

683,119. Oscar Kaltwasser and Hugo Jaesschin, Berlin, Germany. Assignors to Actien-Gesellschaft für Anilin Fabrikation, same place. **Blue azo dye.** Combines diazotized 4-chloro-2-amino phenolsulphonic acid, with 1,8-aminonaphthol-2,8-disulphonic acid, which as a sodium salt is a dark powder, soluble in water blue-red, changing to violet on adding sodium carbonate, and to a fine red with caustic soda lye, hardly soluble in alcohol, easily in concentrated sulphuric acid to red-violet, that on adding water becomes blue-red, dyeing wool fine blue with the aid of copper salt.

683,120. Oscar Kaltwasser and Hugo Jaesschin, Berlin, Germany. Assignors to Actien-Gesellschaft für Anilin Fabrikation, same place. **Black disazo dye.** Obtained by combining 1,8-aminonaphthol-4-sulphonic acid in an acid solution of diazonaphthalene, and then coupling the product with a diazo compound of 4-chloro-2-aminophenolsulphonic acid in an alkaline solution forming in a dry state a dark powder, hardly soluble in alcohol, easily soluble in water dark blue, unchanged by a little caustic soda, but precipitated by excess thereof, as well as by mineral acids, dissolving dark blue in concentrated sulphuric acid, the solution separating blue-black flakes on dilution with water, producing on wool from acid-baths blacks that are fixed by alkaline chromates.

683,161. Wm. G. White, Anerly, and Robert A. A. White, Rotherhithe, England. **Polychrome printing block,** of stearic acid, vegetable wax, linseed oil, resin, and a quantity of alkali less than the saponification equivalent of the stearic acid, acetate of chrome and color.

Digitized by Google

683,177. Philip J. Hope, Everett, Mass. **Paint-removing composition.** Air slaked lime, 48 ; white soda ash, 48 ; water to make a paste thereof, and paraffin oil, 2 ; parts by weight.

683,188. Frank N. Spear, Los Angeles, Cal. Process of **treating lime** by slaking powdered quicklime with steam, then bringing the powder in contact with carbon dioxide.

683,190. Richard Taggesell, Buffalo, N. Y. Assignor to Schoellkopf, Hartford and Hanna Co., same place. **Brown dye,** soluble in water and in concentrated sulphuric acid ; from the latter solution, it is precipitated in dark flakes on adding water, and made by diazotizing a *m*-aminotolyloxaminesulpho acid, combining the resulting diazo compound with *g*-aminonaphtholsulpho acid in alkaline solution, heating the resulting compound with a saponifying agent, tetrazotizing the product, combining the tetrazo compound with *m*-diamine of the benzene series and uniting the resulting dye with two molecules of a diazotized aminosulpho acid.

683,210. Edward C. L. Kressel, London, England. **Alimentary extract** from yeast, subjected to a temperature sufficient to kill the yeast cells without coagulating all the proteids, hydrating the coagulated and insoluble proteid matter to convert it into peptones, separating the solid matter and condensing the resulting fluid.

683,211. Oliver C. Lacey, Newport News, Va. Assignor to New York Fire Proof Co., same place. **Fire extinguishing compound.** Sodium bicarbonate, 100 ; manganese chloride, 12 ; ammonium sulphate, 3 ; dry powdered kaolin, 12 ; parts by weight.

683,212. Oliver C. Lacey, Newport News, Va. Assignor to New York Fire-Proof Co., same place. **Fire-proofing compound.** Manganese chloride, 42 ; silicon, 1 ; ammonium chlorid, 2 ; ammonium sulphate, 1 part, dissolved in water.

683,325. Henry J. Phillips, London, England. Assignor to the Golden Link Consolidated Gold Mines, limited, same place. **Extraction of precious metals** from refractory sulphide or telluride ores without roasting, by subjecting the powdered ore under heat and pressure to solutions of alkaline polysulphides of such strength as to dissolve all base metals and leave the gold to be recovered by any known process.

683,354. Felix C. Thiele, New Orleans, La. Assignor of three-fifths to John Finke and John M. Parker, same place. **Refining crude mineral oils.** Agitates oils of the Lima type containing sulphur with nitric acid till the evolution of sulphurous gas ceases, then agitates with an alkali and a hydrogen producing metal as zinc or aluminum and iron till the dilute sulphuric acid does not generate nitrous acid in a test portion, then washes first with water and then with sulphuric acid to remove ammonia and basic compounds and then distils.

Digitized by Google

REVIEW OF AMERICAN CHEMICAL RESEARCH.

VOL. VIII. No. 5.

WILLIAM A. NOYES, Editor.

REVIEWERS:

M. T. Bogert, Benton Dales, W. F. Hillebrand, H. N. McCoy, S. P. Sadtler, E. M. Chamot, L. M. Dennis, L. P. Kinnicutt, A. A. Noyes, J. O. Schlotterbeck, F. P. Underhill, B. S. Cushman, A. H. Gill, H. W. Lawson, J. W. Richards, W. H. Seaman,

INORGANIC CHEMISTRY.

The Alloys of Lead and Tellurium. BY HENRY FAY AND C. B. GILLSON. *Am. Chem. J.*, **27**, 81–95.—Crude tellurium was purified by conversion into the basic nitrate, decomposition of this by heat, solution of the oxide in hydrochloric acid, and precipitation of the element by sulphur dioxide. After fusion the tellurium so prepared is crystalline and silver-white. It melts at 446° and has the specific gravity 6.243. The alloys were made by adding granulated tellurium to molten lead. Union occurred with evolution of light and heat. The freezing-points of the alloys were determined by means of a Le Chatellier pyrometer and a curve drawn showing the relation between freezing-points and composition. The analysis was accomplished by volatilizing the tellurium as chloride in a stream of chlorine, at the melting temperature of lead chloride, and weighing the latter substance. The freezing-point curve rises rapidly from 322°, the point for pure lead, to 917°. It then drops gradually to 400° and rises slowly to 446°, the point for pure tellurium. The alloy of maximum melting-point is pure lead telluride, PbTe. That melting at 400° is the eutectic of lead telluride and tellurium. Excellent reproductions of photomicrographs illustrate the structure of the alloys. For the microscopical examination the alloys were polished and etched with very dilute hot nitric acid. The lead telluride appeared as a dark perfectly homogeneous substance. Alloys with more lead are plainly seen to be mixtures of this compound with metallic lead. The alloy of lowest freezing-point contains 78 per cent. tellurium. This is the eutectic and has a fine-grained heterogeneous structure, characteristic for such alloys. Alloys intermediate in composition between lead telluride and the eutectic are seen to be mixtures of the two, while those

Digitized by Google

with less lead than the eutectic consist of a mixture of the latter with tellurium. The hardness increases with increasing tellurium. Those with over 50 per cent. tellurium are very brittle.

H. N. McCoy.

The Alloys of Antimony and Tellurium. By Henry Fay and Harrison Everett Ashley. *Am. Chem. J.*, **27**, 95–105. —The alloys were made in the manner indicated in the preceding abstract. No evolution of heat was noticeable. The freezing-point curve is of the same general character as that for lead and tellurium alloys. It differs in showing a lowering between the point for pure antimony, 624°, and that for antimony telluride, Sb_2Te_3, 629°. Antimony telluride and metallic antimony form isomorphous mixtures. The curve has a minimum at 421°, representing the eutectic of antimony telluride and tellurium. From this point the curve rises to 446°, the point for tellurium. The article is illustrated by reproductions of five photomicrographs. The surfaces were prepared by polishing and electrolyzing in dilute hydrochloric acid or ammonia. The pure antimony telluride is of uniform structure. The eutectic shows a characteristic structure. Alloys of compositions intermediate between those of antimony telluride and the eutectic are seen to be mixurres of the two. Alloys with more tellurium than the eutectic aie shown to be mixtures of these two. Determinations of spetcfic gravities of the alloys led to no definite conclusions.

H. N. McCoy.

A Simple Apparatus for Demonstrating the Manufacture of Water-Gas. By C. E. Waters. *Am. Chem. J.*, **27**, 139–142. —Steam, generated in a flask and superheated by passing through a quarter-inch iron pipe contained in a combustion furnace, is passed over red hot coke. The coke-tower consists of a 2-inch iron pipe, asbestos lined, capped at both ends, and held upright by clamps. Oxygen and steam are passed in alternately at the lower end of the large pipe. The coke is ignited in the stream of oxygen by means of charcoal and a cotton wick fuse. During the heating the combustion products escape through an opening at the top. When steam passes, water-gas is led off and collected in a cylinder. The product contains about equal amounts of carbon dioxide, carbon monoxide, and hydrogen, in addition to some nitrogen.

H. N. McCoy.

The Conversion of Orthoperiodic Acid into Normal Periodic Acid. By Arthur B. Lamb. *Am. Chem. J.*, **27**, 134–139.— Orthoperiodic acid, H_5IO_6, was heated to 100° at 12 mm. pressure. The weight was constant after twenty to twenty-five hours. As shown by the loss of weight and by the analysis, the product was nearly pure normal iodic acid, HIO_4. The acid so obtained

Digitized by Google

was white or slightly yellowish in color. It hisses when dropped into water. Attempts to make periodic anhydride by heating to 138°, both in vacuum and at atmospheric pressure, gave instead much iodic anhydride. Acetyl chloride precipitates iodic anhydride from a solution of HIO_4 in glacial acetic acid. Acetic anhydride reduces periodic acid to the iodic condition. Perchloric acid decomposes HIO_4. Attempts to obtain H_3IO_5 by heating H_5IO_6 in a vacuum to temperatures below 100° failed to give this body. H. N. McCoy.

New Salt of Glucinum. Abstract in *Sci. Am.*, **86**, 103. Work of URBAIN AND LACOME.—Beryllium hydroxide, by treatment with acetic acid, gives a salt which crystallizes in needles or octahedrons from glacial acetic acid. It is insoluble in cold and is decomposed by hot water. Easily soluble in chloroform. Melting-point, 284° ; boiling-point, 331°. The vapor is stable, even in contact with air, at 360°. A vapor-density determination showed the molecular weight to be 401. The formula given is $(CH_3CO_2)_6Be_4O$. H. N. McCoy.

Electrolytic Apparatus for Hydrogen and Oxygen. *Sci. Am.*, **86**, 107.—The article describes briefly a new apparatus by Schuckert and Co., for producing the gases on a large scale. Iron tanks and a 15 per cent. caustic soda solution are used. Each element holds 10 gallons of solution. It requires 3 volts and 600 amperes, and produces 55 gallons of hydrogen and 28 of oxygen per hour. The electrolysis is conducted at 70°. H. N. McCoy.

Hydride of Potassium. By H. MOISSAN. *Sci. Am.*, **86**, 124. —Hydrogen unites with potassium at 360°, forming a hydride which condenses in the cool part of the tube in which it is made in fine white needles. The compound has the formula KH and a density of 0.8. It is extremely active. In a vacuum it dissociates below a red heat into its components. It reacts violently with water forming potassium hydroxide and hydrogen. It takes fire in dry oxygen or fluorine, giving potassium hydroxide and water in the first case, and potassium fluoride and hydrofluoric acid in the second. It becomes incandescent in contact with chlorine, forming potassium chloride and hydrochloric acid.
H. N. McCoy.

The Action of Hydrogen Sulphide upon Arsenic Acid. By LEROY W. MCCAY. *Zeit. anorg. Chem.*, **29**, 36–51.—The author reviews his previously published work on this subject and describes the exact conditions for the formation of mono- and disulpharsenic acids and the preparation of their sodium salts. Monosulpharsenic acid is the first product of the action of hydrogen sulphide on arsenic acid. It was isolated, in large amount, in the form of its sodium salt, $Na_3AsO_3S.12H_2O$. Disulpharsenic acid

Digitized by Google

was formed in small amount and isolated by means of its difficultly soluble barium salt. From this the sodium salt, $Na_3AsO_2S_2.11H_2O$, was prepared.

As the result of these and other reactions the author concludes that the action of a great excess of hydrogen sulphide, passed in a rapid stream into an acidulated solution of arsenic acid, takes place according to the following successive steps :

$$(a).\quad H_3AsO_4 + H_2S = H_3AsO_3S + H_2O.$$
$$(b).\quad H_3AsO_3S + H_2S = H_3AsO_2S_2 + H_2O.$$
$$(c).\quad H_3AsO_2S_2 + H_2S = H_3AsOS_3 + H_2O.$$
$$(d).\quad H_3AsOS_3 + H_2S = H_3AsS_4 + H_2O.$$
$$(e).\quad H_3AsS_4 = As_2S_5 + 3H_2S.$$

The pentasulphide is actually the final product under the above conditions. If the stream of gas be slow or intermittent the following additional reactions occur :

$$(f).\quad 2H_3AsO_3S = 2H_3AsO_3 + 2S.$$
$$(g).\quad 2H_3AsO_3 + 3H_2S = As_2S_3 + 6H_2O.$$
$$(h).\quad 6H_3AsO_2S_2 = As_2S_5 + As_2S_3 + 4S + 2H_3AsO_3 + 6H_2O.$$

H. N. McCoy.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

Alkali Lakes and Deposits. By W. C. Knight and E. E. Slosson. *Univ. of Wyoming (Wyoming Expt. Station) Bull., No. 49 [Alkali Series VI*, pp. 69–123], June, 1901.—The very numerous deposits of salts in Wyoming, bearing the common name "alkali" in the West, are here considered in general, and also in detail under the headings Downey, Union Pacific, Rock Creek, Bothwell, Morgan, Independence, and Gill. They are confined to Albany, Natrona and Carbon counties in the southeastern part of the State. The deposits occupy undrained depressions in geological formations extending from the Triassic to the present time, and range from mere efflorescences to beds sometimes fifteen feet in thickness. Because covered with water in the spring of the year they are sometimes called lakes, but with rare exceptions they are dry and snow-white by the end of summer. In the depressions the larger beds vary in size from a few to one hundred acres and are always found resting on a muddy base. The mud smells of hydrogen sulphide and contains the same salts that form the deposits lying upon it. Contrary to former opinions, the deposits are rarely very pure, being not only mixtures of several salts but made up of alternating layers of salts, sand, and mud. Chemically they can be divided into two classes, those carrying carbonates in quantity and those that do not. The former contain as principal salts sodium carbonate, sulphate, and chloride; the latter sodium and magnesium sulphates and sodium chloride. Gypsum occurs but is not a prominent constituent. Traces of potassium, lithium, iron, aluminum,

Digitized by Google

manganese, borates, nitrates, sulphides, and phosphates are often found. The analyses are restricted to the commoner ingredients and represent in general average samples rather than selected crystals of any one salt. Mirabilite constitutes the greater mass of most of the deposits, though epsomite is abundant and in some cases exceeds the mirabilite. Sodium chloride is always subordinate. At Green River, a water struck at a depth of 125 feet is noted for its content in sodium carbonate with but traces of sulphates. Not only do different deposits vary greatly in composition, but different parts of the same bed show often very different proportions of the same component salts.

For various reasons it is concluded that the salts cannot have been derived from the Archaean or Palaeozoic rocks, or to any great extent from springs, as Ricketts' thought, but that their source is the Mesozoic and Cenozoic formations, with which they must have been originally carried down instead of being stored in deposits. "Later through the mountain-making agencies these formations were brought to the surface and through the influences of decomposition and erosion have been converted into soil. The salts have remained in the soils so formed, since there has not been sufficient water to leach them out." The fact that the composition of adjoining beds may differ radically is explained as to the sulphates thus: "The deposit rich in Epsom salt occupies the lowest point in the basin. Magnesium sulphate is more soluble than sodium sulphate at ordinary temperature, and in the case of a heavy rain when the soda had been deposited in the small depressions above the larger ones, the freshet would carry away the magnesium sulphate to the lowest depression, where it is found. The magnesium sulphate being much more soluble, would also tend to store the Epsom salts in the lowest depression on account of the percolation of the water, rich in these salts, to the lower level." W. F. HILLEBRAND.

Genesis of Ore Deposits. *Am. Inst. Min. Eng.*, 1902, xli + 806 pp.—This volume is in part a second edition of that issued in 1895, which contained only the important treatise of Posepny bearing the above title and the discussions based upon it. There have now been added numerous original papers, as given below, together with important discussions, which have been presented at the meetings of the Institute at and since the Washington meeting in 1900. To attempt any review here is impossible, hence the titles only of the later papers are given, many of which are replete with matter of the greatest importance to the chemical geologist. "Some Principles Controlling the Deposition of Ores," by C. R. van Hise; "The Secondary Enrichment of Ore Deposits," by S. F. Emmons; "The Enrichment of Gold and Silver Veins," by Walter Harvey Weed; "Metasomatic Processes in Fissure Veins," by Waldemar Lindgren; "Problems in the

Digitized by Google

Geology of Ore Deposits," by J. H. L. Vogt; "The Rôle of the Igneous Rocks in the Formation of Veins," by J. F. Kemp; "The Caliche of Southern Arizona, an example of Vadose Circulation," by William P. Blake; "The Character and Genesis of Certain Contact Deposits," by Waldemar Lindgren; "The Formation of Bonanzas in the Upper Portions of Gold Veins," by T. A. Rickard; "Some Principles Controlling the Deposition of Ores (concluding contribution)," by C. R. van Hise.

W. F. HILLEBRAND.

Influence of Country Rock on Mineral Veins. BY WALTER HARVEY WEED. *Trans. Am. Inst. Min. Eng.*, Mexican Meeting, 1901. 19 pp.—The author's conclusions are: "1. The structural character of vein-fissures, such as course, width, etc., vary with the nature of the country rock. 2. The mineral contents of veins formed wholly by the filling of open fissures are not affected by the nature of the vein-walls. 3. The mineral contents of ore deposits formed by metasomatic replacement vary with the nature of the enclosing rock. 4. As metasomatic processes vary in character with the nature of the solutions, no invariable general relation can be established between certain rock types and rich ore deposits."

W. F. HILLEBRAND.

Some Recently Exploited Deposits of Wolframite in the Black Hills of South Dakota. BY J. D. IRVING. *Trans. Am. Inst. Min. Eng.*, Richmond Meeting, 1901. 13 pp.—Near Lead City are two localities where this mineral occurs as an ore replacing dolomitic limestone. The ore occurs in horizontal, extremely irregular masses, up to 2 feet in thickness, and of 20 to 30 square feet maximum area. It is intimately associated with the "shoots" of refractory silicious gold ore which carry, when unoxidized, pyrite, fluorite, barite, and sometimes gypsum. The wolframite is always found in the oxidized areas of the silicious ores which are free from sulphides, and is to be considered rather as a basic phase of it than as a distinct and separate deposit. The wolframite ore is a dense, black, massive rock resembling a fine-grained magnetite, and shows numerous irregular cavities which are often lined with crystals of wolframite, or scheelite, or barite. From two analyses by the reviewer the following proportions of the three chief mineral components are calculated: wolframite 75.60 and 51.58; scheelite 4.77 and 27.68; quartz 12.54 and 9.60. Among the minor ingredients are As_2O_5, P_2O_5, V_2O_5, BaO, and SrO. The ore is rarely valuable for its gold content. The mode of occurrence is unique among wolframite deposits. Brief consideration is given to their probable concentration by ascending water currents.

W. F. HILLEBRAND.

Igneous Rocks from Eastern Siberia. BY HENRY S. WASH-

Digitized by Google

INGTON. *Am. J. Sci.*, 13, 175–184.—Foyaite, from "south of Whalen or Itschan, East Cape," and comendite, quartz-porphyry, rhyolite, obsidian, and monzonite, all from "the head of Iskegan Bay," southwest of East Cape, are described, accompanied by analyses of the two first by the author. Of the series, the foyaite offers most of interest. Among its constituents may be mentioned considerable of a granular material which "must be regarded as hydronephelite" and a little purple fluorite.

W. F. HILLEBRAND.

On the Occurrence of Monazite in Iron Ore and in Graphite. BY ORVILLE A. DERBY. *Am. J. Sci.*, 13, 211–212.—The iron ore is from the fazenda Catita, on the lower Rio Doce in the state of Espirito Santo, Brazil, and consists of magnetite and ilmenite, probably from a segregated mass of oxides in a coarsely granular rock. The monazite is quite abundant in it. The graphite is from the region of the river Jequitinhonha in Minas Geraes, and from near São Fidelis in Rio de Janeiro. Monazite constitutes in both cases the mass of the non-carbonaceous residue. It is suspected that this mineral may prove to be rather generally distributed in the graphite of gneiss and granite.

W. F. HILLEBRAND.

On the Occurrence of Chrompicotite in Canada. BY G. CHR. HOFFMANN. *Am. J. Sci.*, 13, 242.—This rare variety of chromite occurs somewhat abundantly in veins or dikes in the volcanic series of the Miocene Tertiary in the district of Tillooet, British Columbia. The mean of two analyses by R. A. A. Johnston shows: Cr_2O_3, 55.90; Al_2O_3, 13.83; FeO, 14.64; MgO, 15.01; SiO_2, 0.60; total, 99.98. W. F. HILLEBRAND.

Geology of the Northeast Coast of Brazil. BY JOHN C. BRANNER. *Bull. Geol. Soc. Am.*, 13, 41–98.—The only chemical data in this paper are a few analyses: Cretaceous limestone from Parahyba do Norte, a very pure marble from São Caetano, Cretaceous (?) limestone from near Penha, and five partial analyses of waters from the line of the Great Western of Brazil Railway.

W. F. HILLEBRAND.

Sulphur, Oil, and Quicksilver in Trans-Pecos, Texas. *The Univ. of Texas Mineral Survey, Bull. No.* 2. 43 pp. 1902.—This is a report of preliminary surveys of the counties of Brewster, El Paso, Jeff Davis, Pecos, Presidio, and Reeves, which make up the region known as Trans-Pecos. But little more of the mercury deposits in Brewster County is told us than has already appeared in other publications (see Abst., 24, 73). The ores occur both in hard Cretaceous limestone and partly decomposed bluish shale. Very rich pockets are found, and but little underground work is done as yet. The production in 1900 was

Digitized by Google

1750 flasks, holding about 76 pounds, and 3400 flasks in 1901. A fair quality of coal is said to exist not far away, which may solve the important fuel problem.

The sulphur deposits long known to exist in northeastern El Paso County have received preliminary attention from Mr. E. M. Skeats and are found to be extensive, an important fact in view of the limited domestic production. Fuel is needed, however, for their development, but indications of oil have been found in the region. The sulphur is at or near the surface, in a vast gypsum tract, noted for its sulphur springs, and is at times very pure. A peculiar fact in connection with it is the large amount of free sulphuric acid found in the ground water at depths as small as 10 feet. Two analyses of this water are given, showing 365 and 2470 parts of solids (almost entirely sulphates) per 100,000, exclusive of free acid. The first of the two held in addition 136 parts of free sulphuric acid. The waters are charged with hydrogen sulphide, which may be the source of the deposits. The question of origin is discussed, but no definite conclusions are reached.

W. F. HILLEBRAND.

Preliminary Report on the Lead and Zinc Deposits of the Ozark Region. BY H. F. BAIN, with an introduction by C. R. VAN HISE, and chapters on the Physiography and Geology, by GEO. I. ADAMS. *U. S. Geol. Survey, 22nd Ann. Rep., Part II*, 23–227.—In the introductory chapter Professor van Hise applies his now well-known theories (see Abst., **24**, 68) concerning the deposition of ores, not only to the lead-zinc region of the upper Mississippi, but to the deposits of the Ozark region as well. In all the districts there is a very marked similarity of lithologic succession. Cambro-Silurian limestones, originally bounded on both sides by shales, which latter by virtue of their impermeability have exerted a marked influence in the development of the ore deposits, are the ore carriers, and doubtless originally furnished the metal for concentration. Excepting the ores occurring in the crystalline rocks of Missouri, the following vertical distribution holds good: "Above and near the level of ground water oxidized zinc and lead ores with galena occur; below the level of ground water are zinc sulphides, with subordinate quantities of lead sulphide; and at depths iron sulphides increase and locally become dominant." From these and other observations the author is led to believe that the theory of two concentrations, first applied by him to the Wisconsin region, holds equally for the whole Ozark ore area. There was first a concentration of the widely disseminated metal by ascending waters in artesian circulation; then, as the upper shales became eroded, a second concentration by descending waters was initiated. Nowhere did unusual thermal conditions enter as a factor in ore deposition, which was certainly wholly dependent on comparatively shallow

Digitized by Google

water circulation. The various reactions that may be supposed to have taken place receive due consideration. The analytical data are confined to a few analyses of cherts, but the chemical geologist will find the report well worth careful study.

W. F. HILLEBRAND.

ANALYTICAL CHEMISTRY.

The Spectrum of the Enclosed Arc. BY DR. LOUIS BELL. *Electrical World and Eng.*, **39**, 195.—The enclosed alternating series arc gives a spectrum essentially discontinuous, while that of the ordinary open arc is principally a continuous one. There is in the enclosed arc spectrum a relatively dull continuous spectrum background, and upon this stand out six carbon bands with great distinctness. These bands are quite evenly distributed throughout the visible spectrum from the crimson to the violet, the broad one in the violet being the most striking. The spectrum of the ordinary enclosed series continuous current arc proved to be practically identical with that of the alternating series, but with perhaps somewhat more of a continuous spectrum. The violet band accounts for the remarkable photographic activity of the enclosed arc, and also for the violet tinge of many of them. The evenness of distribution of the bands explains why colors can be accurately judged by this light even though it gives an essentially discontinuous spectrum.

BENTON DALES.

Note on the Spectrum of the Enclosed Arc. BY WILLIAM LINCOLN SMITH. *Electrical World and Eng.*, **39**, 334.—The author plots spectrophotometric measurements comparing the light intensities of a 70-volt enclosed arc, a three-glower Nernst lamp, and a clear sky. The intensity of the Nernst lamp in the lower red is about 0.8 that of the sky, whereas in the region of the G line it is only about 0.01. The ratio between the arc and the lamp in the region of the B line is 0.4, while at the G line it is 1.3. The curve for the arc shows five maxima, of which three coincide with the first, second and sixth of the bands described by Dr. Bell; another maximum falls wholly below the limit of his first band, while the remaining one is apparently due to the joint effect of his third and fourth bands. There is no maximum corresponding to his fifth band. The light obtained from a 220-volt enclosed arc shows an intensity of 0.6 at the B line compared with the Nernst lamp, while at the G line the ratio is 6.9.

BENTON DALES.

A Rapid Method for Determining the Value of "Chromic Acid" and the Soluble Chromates. BY LYMAN F. KEBLER. *J. Franklin Inst.*, **153**, 57–59.—The following method is given by

Digitized by Google

the author: Weigh off about 1 gram of the substance, dissolve it in water and dilute to 100 cc. Transfer 20 cc. of the solution to an evaporating dish, add 75 cc. of water, 2 grams of potassium iodide and 15 cc. of 10 per cent. sulphuric acid and then mix well. The reaction is almost instantaneous. The iodine set free is determined by hyposulphite solution in the usual manner.

Of five samples of "chromic acid" examined by the author only one was free from sulphates, and two were a mixture of chromic acid and primary sodium sulphate in such proportions that it was evident that they had been prepared by treating sodium dichromate with sulphuric acid and evaporating the mixture to dryness. B. S. CUSHMAN.

A New Test for Albumin. BY FLORA C. FUHS. *New York Med. Record*, 61, 374.—This new and simple test is based upon the following facts: (1) Albumin is coagulated by carbolic acid; (2) equal volumes of non-albuminous urine and a mixture composed of equal parts of carbolic acid and glycerine form an emulsion which clears up entirely on agitation, leaving a perfectly transparent and highly refractive liquid; (3) equal volumes of albuminous urine and the above-mentioned carbol-glycerine solution, when mixed together, produce a white turbidity, which remains in spite of agitation, and does not precipitate upon standing, nor redissolve.

Test.—Two cc. of a carbol-glycerine mixture are poured into a test-tube and 2 cc. filtered urine are added. Mix thoroughly. If a clear, transparent liquid results, there is no albumin present, but if the slightest turbidity is noticeable the urine is albuminous.

F. P. UNDERHILL.

On the Determination of Chlorine in Natural Waters, Its Accuracy and Significance. BY ERASTUS G. SMITH. *Trans. Wisconsin Acad. Sci. Arts and Letters*, 13, Part I, 359–365.—The author gives the precautions which long experience has shown to be necessary in using the silver nitrate-potassium chromate method in order to obtain exact results with natural waters low in chlorine. There are required a long thin burette graduated to tenths; three white porcelain dishes uniform in color and slightly over 100 cc. in capacity; and the usual solutions, including one of sodium chloride. The silver nitrate should be made neutral by carefully fusing, and all the solutions should be made with water distilled over silver nitrate to remove chlorine and traces of organic matter. Redistilled chlorine-free water (100 cc.) and potassium chromate (1 cc.) are measured into two of the dishes. The silver solution is run into one of them till the distinct reddish color is permanent for five minutes. The burette reading gives the correction to be applied. In the third dish, 100 cc. of the water is similarly treated till the first color is

Digitized by Google

exactly matched and equally permanent. This end reaction is slow in setting but exact. With colored waters a little chlorine-free alum, or better precipitated aluminum hydroxide, is added. After settling over night, the color is found to be discharged. With waters high in chlorine, it is well to add to the comparison dish enough salt solution to about equal the chlorine contents of the natural water, otherwise the end colors will not match.

W. F. HILLEBRAND.

METALLURGICAL CHEMISTRY.

Department of Mines and Metallurgy of the World's Fair at St. Louis. BY D. T. DAY, Chief. *Age of Steel*, January 4, 1902.—Greater prominence will be given to these subjects than at any previous exposition. The building will be larger than the Mining Building at Chicago. Methods of mining, sluicing, hydraulicing, etc., will be illustrated by practical examples. The mineral center of the United States is near St. Louis, and its location will render it accessible as a gathering place for the great mining and metallurgical societies of America.

J. W. RICHARDS.

The Mexican Meeting. BY F. J. FRANK. *Mines and Met.*, January, 1902.—A well-written, illustrated account of the Mexican Meeting of the American Institute of Mining Engineers, of considerable length and giving many technical details regarding the mines and smelting works visited. J. W. RICHARDS.

The World's Progress in Science, Industry and the Arts, in 1901. BY R. GRIMSHAW. *Age of Steel*, January 4, 1902.—An interesting collection of two or three hundred short paragraphs. In the line of *Metallurgy* are mentioned Ridsdale's results on the rolling of steel, Rossi's experiments with titanium in iron, 'Jupiter' steel, the St. Etienne process of compressing steel ingots from beneath. In *Chemistry*, Pictet's discoveries regarding the separation of oxygen from air, a new process of corroding lead to make white lead, the alloy of aluminum and magnesium called 'Magnalium,' use of glass for building stone, and synthol as a substitute for alcohol. Truly a miscellany.

J. W. RICHARDS.

Mining and Metallurgical Progress in the United States in 1901. *Eng. Min. J.*, January 4, 1902.—*Coal:* The output is estimated at 300,000,000 short tons, nearly all of which was consumed at home. More than half the total was mined in Pennsylvania. The anthracite production was 65,000,000 short tons, an increase of 8,000,000 tons over 1900. The smokeless coal of Arkansas, and the mines of Indian Territory have been greatly exploited. *Coke:* Production and consumption have been greater

Digitized by Google

than ever before in our history. *Oil:* The discovery in Texas has been of the highest importance, ranking next to the Pennsylvania and Baku fields. This, with the increased output from California, will undoubtedly have a marked effect on the coal trade of the Southwestern States. *Iron ore:* The Lake Superior region mined 20,650,000 tons, and other regions 7,500,000 tons, making a total of 28,150,000 tons. *Pig iron:* Estimated at 15,800,000 long tons, an increase of 2,000,000 tons over 1900. This is larger than the combined output of Great Britain and Germany, which undoubtedly fell off in production in 1901. The increased production came mostly from the Middle West and the Southern States. *Gold:* Recorded a substantial increase, and probably reached between $82,000,000 and $83,000,000. The increase was principally from the Black Hills, Colorado, and California, in the latter state largely from dredging of low-grade placer deposits. *Silver:* The output was approximately 59,500,000 ounces, or practically the same as in 1900; the output of the world undoubtedly decreased. *Copper:* The output was probably 2,500 tons less than in 1900; the decrease was most marked in the Butte District, Montana, and in Arizona. Our copper refineries commenced last year to refine foreign copper, in addition to our own domestic, drawing from Canada, Mexico, Tasmania (Mount Lyell mines), Chili, and Peru. *Lead:* Showed a decrease of 10,000 tons, production being ahead of consumption, caused by the phenomenal output of 275,000 tons in 1900. The lead industry has not been prosperous outside of the United States. *Zinc:* There was undoubtedly a gain over the 123,381 short tons produced in 1900. *Aluminum:* There was undoubtedly a gain over the previous year's production. *Tin:* No deposits were discovered, and none are being worked. *Mercury:* Development was very active in California and Oregon, while the Terlingua district in Texas has developed an output of 3,000 flasks a year, and promises a larger capacity in the near future. *Nickel:* The Sudbury district in Canada is rapidly increasing the supply of ore, most of which is refined in the United States. Prospecting is active in Nevada, and there are promises of domestic production of ore in 1902. *Platinum:* The product was greater than in any previous year, but is still small. The metal is saved principally from placer gold by the "Butler Board;" but discoveries of platinum *in place* have been made in the Grand Encampment District, Wyoming, near Weaversville and Junction City, California, and near Kirby, Oregon, so that future increases may come from these sources. *Antimony:* The output was smaller. *Precious Stones:* More were found, imported and sold than in any previous year. The principal features, as summarized by Mr. Kunz, are the sapphires from Montana, beryls from Mitchell Co., N. C., turquoise from Nevada and New Mexico, pink garnets from Macon Co., N. C., colored tourmalines from San Diego Co., Cal.

Digitized by Google

Bauxite was probably the same as 1900,—20,000 tons. Arkansas shipped only 1,600 or 1,700 tons, but a considerable increase may be looked for from this State, as large deposits of very pure material have been discovered. *Salt*, *borax*, *cement*, *clay*, and other non-metalliferous minerals have probably all exceeded the output of 1900. J. W. RICHARDS.

The British Coal Question. BY C. M. PERCY. *Age of Steel*, December 7, 1901.—A review of Prof. Jevon's paper on this subject, in 1865, the report of the Royal Commission, in 1870, and an estimate based on present data. The writer's, of the total British reserve, is 130,000,000,000 tons within a depth of 4,000 feet, and 50,000,000,000 tons below that depth. By providing ample fresh air, the temperature will not prevent mining at greater depths than 4,000 feet. The quantity of coal available within practicable mining depths will supply an annual output of 250,000,000 tons for the next seven hundred years.
J. W. RICHARDS.

The Development of Industrial Fuels. BY W. G. IRWIN. *Age of Steel*, January 4, 1902.—A history of the mining of anthracite and bituminous coals in America, a classification of the various fields geologically, and account of the rise of the coking industry. The anthracite fields cover about 500 square miles, the bituminous fields 200,000 square miles; the output of the former, in 1901, was 55,000,000 tons, of the latter 233,000,000 tons. There are probably 50,000 coking ovens in operation, half of which are in the Connellsville region. About 3,000 by-product ovens are now in operation, most on the Otto-Hoffman system. This style of coking will revolutionize the coke industry, the complete eradication of the beehive oven being only a matter of time, for it gives 75 to 80 per cent. of coke, instead of 65 per cent., and the by-products are in the aggregate of great value. Six million tons of coal was exported to eleven different European countries, and half a million tons of coke to twenty-two countries in 1901. Our supply of bituminous coal is at least 1,280,000,000,000 tons, which would last for some 6,000 years, at the present rate of output. J. W. RICHARDS.

Sixteenth Annual Review of Lake Superior Iron Ore Trade. BY H. J. STEVENS. *Age of Steel*, January 11, 1902.—Wages have been high, work steady, and the prospect for 1902 could not be brighter, since furnaces are sold so far ahead that the demand for ore is assured. Iron was first discovered under an uprooted stump at Negaunee, in 1844, resulting in the opening of the Jackson Mine. After the opening of the Soo Canal, the growth of the industry was rapid, doubling or trebling every five years. The ore shipments for 1901 were 20,129,243 tons, nearly

Digitized by Google

half of which came from the Mesaba range, and one-sixth each from the Marquette and Menominee. The Mesaba ore, however, is not quite equal in quality to the others; the Fayal mine is the largest single mine, producing alone over 1,500,000 tons.

J. W. RICHARDS.

Modern Iron Blast-Furnace Practice. BY F. H. CROCKARD. *Eng. Mag.*, January, 1902.—The Lucy furnace, of Pittsburg, is the primary furnace of the present type, with a production of 91 tons daily, capacity 169 cubic feet for each ton per day. Edgar Thompson furnace B followed this with 132 tons daily, and 135 cubic feet capacity per ton of iron daily. In both these cases the fuel consumption was 2,850 pounds of coke per ton of iron. These furnaces showed rapid driving, high production, and high fuel requirement. The North Chicago Rolling Mill furnace No. 7, blown in in 1885, averaged 200 tons daily, with fuel 1912 pounds, thus affording more rapid driving with great economy of fuel. At the Youngstown furnaces, one furnace averaged for October, 1900, 570 tons daily, with fuel consumption 1777 pounds. One of the Carrie furnaces at Rankine, Pa., has produced 780 tons in one day. The task of supplying, say 2000 tons of material daily to such furnaces can only be accomplished by the most modern methods of stock-yards, bins, cranes, and automatic machinery. For elevators, the inclined hoist has replaced the vertical hoist tower. The charging apparatus is a lock arrangement, preventing the discharge of furnace-gases. Casting machines are necessarily used to deal with the large output of pig iron. Several works, notably the Illinois Steel Co., are making a high grade of Portland cement from their slag. Water-cooled bosh-plates have greatly increased the life of the bosh walls, enabling 1,000,000 tons of iron to be made on one lining. Small iron arch or socket-plates have replaced large plates, giving better distribution to the cooling plates. Water-cooled blocks are used to increase the life of the throat lining. The Vaughan notch-gun avoids the severe manual labor of opening the tap-hole. Hot-blast stoves have increased in size, rather than any radical change in design. Modern blast-engines are of the vertical cross-compound condensing type, with air and steam cylinders tandem. A 5,000 H. P. engine of this type delivers 57,000 cubic feet of free air per minute, at a pressure of 25 pounds per square inch. Gas engines have not yet been tried. [They are being installed at Sault Ste. Marie. (J. W. R.).]

J. W. RICHARDS.

Iron Making at Port Townsend, Wash. BY A. W. CLAPP. *Eng. Min. J.*, January 25, 1902.—The Pacific Steel Company has revived the plant of the Puget Sound Iron Company, and expect to start making 50 tons of iron daily, this spring. The ores are bought from Tuxeda Island, British Columbia, but the com-

Digitized by Google

pany has its own mines which are being opened. Limestone is brought from Roche Harbor. At the start, coke from Cokedale, Skagit Co., will be used for fuel, but a charcoal burning plant is being constructed, and coke will be discontinued when charcoal is available. There are 20 charcoal kilns, 30 feet high by 30 feet in diameter at the base, each holding 75 cords of wood, the latter being sawed, split, and dropped into the kilns automatically. It is hoped, in time, to save the by-products. The industries of the Pacific Coast will all profit by this plant, particularly when it gets to making steel. J. W. RICHARDS.

The Revival of Iron Mining in New Jersey. BY F. W. E. MINDERMANN. *Eng. Min. J.*, January 25, 1902.—Mr. Joseph Wharton, of Philadelphia, has two blast-furnaces in blast at Port Oram and is building there a third with a capacity of 400 tons per day. These furnaces will consume 52,000 tons of ore per month. He has also obtained control of the Andover furnace, Phillipsburg, which will be remodeled and consume 10,800 tons of ore monthly. The mines now operated are at Hibernia and Black Glen. Extensive improvements have been made at Hibernia, the principal one being the use of a magnetic "cobber" to sort ore crushed to 3-inch size, replacing hand picking, and reducing this operation's cost from 25 to 2 cents per ton. The heads go directly to the furnaces; the tails are crushed to one-fourth inch mesh, and magnetically separated into heads with 57 per cent. of iron and tailings used for concrete.

J. W. RICHARDS.

Electrical Manufacture of Pig Iron. *Elec. Rev.*, January 4, 1902.—The *Echo des Mines* reports that three electric furnaces of 500 H. P. each have been put into operation at Camonica, North Italy, to make pig iron by the Stassano process. The electrodes are placed at the bottom of the boshes, and the furnaces charged with a briquetted mixture of carbon, limestone, and 5 to 10 per per cent of coal-tar. J. W. RICHARDS.

The World's Production of Pig Iron. BY ARCHER BROWN. *Age of Steel*, December 21, 1901.—In 1900, the production was 40,000,000 tons, of which the United States produced 14,000,000 tons, Great Britain coming next, Germany third, etc. In 1901 great changes have taken place; the total will be nearly the same, but the production in the United States has risen to over 17,000,000 tons, or over 40 per cent. of the whole, while almost all other countries, notably Germany and Great Britain, have produced less than in 1900. The United States will not interfere with these countries in their domestic trade, but we will continue to supply our own increasing demands and much general world-trade. J. W. RICHARDS.

Digitized by Google

The Rise and Progress of the Scotch Steel Industry. By B. Taylor. *Age of Steel*, December 21, 1901.—An entertaining history of steel-making in Scotland. The industry practically dates from the incorporation of the Steel Company of Scotland, in 1871. They commenced working on the residue "purple ore" from the Tharsis Copper Company. They have a large plant of acid open-hearth furnaces at Hallside, and supply the ship-builders with mild steel. Practically no steel rails are rolled in Scotland. There are 115 acid open-hearth furnaces in Scotland, with a capacity of 1,200,000 tons annually. There is one Bessemer plant, at Glenjarnick, annual output 60,000 tons. Hematite ores are getting scarcer, and the use of metal direct from the blast-furnaces is rapidly increasing.

J. W. Richards.

The Iron Trade Situation in Europe. By J. S. Jeans. *Age of Steel*, January 4, 1902. Both Germany and Great Britain fell off largely last year, but they are both expending large sums in betterments, with a view to more economical production. Many works have sent agents to America to get the newest ideas, the great majority of the larger plants are being improved and in some cases largely reconstructed, such successful apparatus as pig casting machines and Brown hoisting plants being very favorably regarded. The world is being scoured to replace the failing ore supplies from Bilboa. Coke is being cheapened by the by-product coking plants. Transport is being economized by the adoption of American engines and dumping cars. Labor is being urged to assist in the struggle by moderating its demands. Much will depend on the ore supply. J. W. Richards.

American Iron Trade in 1900. *Age of Steel*, December 7, 1901.—The American Iron and Steel Association gives the following statistics of production for the year 1900: Iron ore, 27,553,161 gross tons; pig iron, 13,789,242 gross tons; Bessemer steel, 6,684,770 tons; open-hearth steel, 3,398,156 tons; crucible steel, 100,562 tons; total steel, 10,188,324 tons; steel rails, 2,385,602 tons; iron and steel structural shapes, 815,161 tons; wire nails, 361,699 tons; iron and steel wire rods, 846,291 gross tons; cut nails, 78,675 tons; plates and sheets, 1,794,528 gross tons; total rolled iron and steel, 9,487,248 tons; tin plate, 302,665 gross tons. Total exports of iron and steel, crude and manufactured, $129,633,480. J. W. Richards.

The Year's Record in Iron and Steel in the Pittsburg District. By W. G. Irwin. *Age of Steel*, January 4, 1902.—The year 1901 was the greatest in the industrial history of this district. Its success is due to a myriad of favorable conditions, first among which is its inexhaustible fuel resources, next water

Digitized by Google

facilities, railway inlets and outlets, gas, oil, other mineral resources, such as limestone and fire-clay, and capable industrial leaders. There are over 5,000 shops, mills, and factories in the district, employing directly over a quarter of a million men, with over two billion dollars of capital invested. The article contains detailed reference to the plants of the United States Steel Corporation, the Crucible Steel Company, Jones and Laughlins, the Westinghouse interests, the Pressed Steel Car Company, various furnaces and foundries, makers of locomotives, tools, machinery, structural steel, allied industries and shipping facilities.

J. W. RICHARDS.

The Pittsburg Iron Trade in 1901. BY R. A. WALKER. *Iron Age*, January 2, 1902.—A record of the consolidations, increases and outputs of plants, of foreign trade, labor troubles, and a detailed record of prices and output of pig iron, steel billets, steel rails, plates, sheets, tubes, structural material, nails, wire, also of Connellsville coke. J. W. RICHARDS.

Iron Manufacture on Lake Superior. *Iron Age*, January 2, 1902.—This industry bids fair to grow rapidly. The works of the Clerque Syndicate at Sault Ste. Marie will soon be making 600 tons daily; at Marquette, the Cleveland Cliffs Company will make 150 tons of charcoal iron daily; at Ashland, Berry Bros., of Detroit, are planning an extensive plant. J. W. RICHARDS.

Alabama's Iron and Related Industries. BY L. W. FRIEDMAN. *Age of Steel*, January 4, 1902.—The pig iron, steel, and iron-pipe industries prospered greatly in 1901. There are forty-two blast-furnaces in the state, three making charcoal iron. Twelve open-hearth furnaces have been in nearly constant operation. A steel-rail mill and cotton-tie mill are projected. The Republic Iron and Steel Company may erect a $2,000,000 plant this year.

J. W. RICHARDS.

Grading of Pig Iron; Its Past, Present, and Future. BY H. E. FIELD. *Age of Steel*, January 4, 1902.—A very clear summary of past practice. The writer does not agree with T. D. West's suggestion to grade irons from 1 to 10 according to the silicon and sulphur percentages, for comparatively few founders know what percentage of silicon and sulphur are best suited to their work, and mixing by analysis is still the exception among the general run of foundrymen. The matter will be solved by a steady development rather than by any radical change, and it will be advisable to retain, as far as possible, the old names while giving them more precise definitions. The writer suggests, on these lines, modifying the grades, retaining the present names, as follows:

Digitized by Google

Present names.	Present per cent. Si.	Proposed per cent. Si.
High silicon	over 6	over 6
Silvery	4 to 6	4 to 6
No. 1	....	3½ to 4
No. 2 soft or X	2¼ to 4½	2½ to 3¼
No. 2	1½ to 3	2 to 2½
No. 3	1 to 2½	1½ to 2
No. 4, or gray forge	1 to 2	1 to 1½
No. 5, or mottled	under 1½	under 1

J. W. RICHARDS.

Cast Iron for Car Wheels. BY W. FAWCETT. *Age of Steel*, December 28, 1901.—Only the highest grades of iron low in sulphur and phosphorus must be used; phosphorus must be below 0.3 per cent., and sulphur below 0.07 per cent. Remelting old wheels increases the sulphur content; therefore, they should be remelted only with new low sulphur iron. J. W. RICHARDS.

Heat Treatment of Cast Iron. BY J. G. SADLIER. *Age of Steel*, December 28, 1901.—A discussion of cupola melting of cast-iron. Reliance must not be placed entirely on the nature of the iron charged, but attention must be given to using just enough fuel, not too little and not too much, just enough blast, to the character of the coke and to the proper handling in ladles, and proper pouring. J. W. RICHARDS.

Art of Cementing or Supercarburizing Steel. *Age of Steel*, December 7, 1901. Lieut. Cleland Davis, of Washington, patents the method of producing a hard surface so as to resist wear or penetration, consisting in subjecting the surface to powerful electric currents passing from carbon electrodes, or from a mass of granular carbon lying on the surface, to the metal to be carburized. If the surface is large, different sections may be treated progressively. The surface within the path of the current is soon brought to a high heat and is impregnated to a greater or less depth by the carbon carried into it from the carbon electrodes or granular carbon. J. W. RICHARDS.

Case-Hardening Steel for Fine Grain. BY E. R. MARKHAM. *Am. Mach.*, January 2, 1902.—A procedure for case-hardening tools of ordinary machine steel. The pieces are case-hardened in pots in the ordinary way and allowed to cool in the oven. When cold, heated in a lead-bath and hardened. If done carefully, writer claims that the grain can be made as fine as tool steel. Directions are given for treating pieces of particular shapes.

J. W. RICHARDS.

Gold and Silver Production in 1901. *Age of Steel*, January 18, 1902.—The estimate of the Director of the Mint, makes the totals for the year as follows: gold in United States, $80,218,800, in

Digitized by Google

British Klondike, $17,595,400; silver in the United States, 59,653,788 ounces. J. W. RICHARDS.

Gold Mining in Eastern Ontario. By C. F. ADAMS. *Mines and Min.*, January, 1902. The greatest activity has been in Frontenac and Hastings Counties. Bromocyaniding is used at the Deloro mines. The details given are principally regarding the workings of the mines. J. W. RICHARDS.

Mills of the San Juan. By F. HARTMAN. *Mines and Min.*, January, 1902.—This region comprises the counties of San Juan, San Miguel, Ouray, Hinsdale, Dolores, La Plata and Archuleta, in Colorado. They are mostly low-grade properties. Stamp crushing and amalgamation are principally used, with cyaniding of the tailings, with hardly any two plants alike in detail, each being adapted to the special conditions of the ore and situation. The tendency is to instal electric power plants.

J. W. RICHARDS.

The Upland Placers of La Cienega, Sonora, Mexico. By R. T. HILL. *Eng. Min. J.*, January 25, 1902.—An interesting, illustrated description of what the writer calls "a diminutive American Kalgoorlie." It is one of the oldest gold districts in America, having been worked nearly 300 years. The district is mesquite desert, through which the Magdalena river flows mostly beneath the sand of its stream bed. Hills rise to about 500 feet, consisting of metamorphosed slates cut by numerous quartz and diorite veins. The disintegrated, weathered material is "dry-washed," with primitive machines of the wheat-fan type. The gold is in large, free sharp grains; wire gold is common. The placer gold is found in a loamy sand on the slopes. The dirt runs about $3 per cubic yard, but only about one-third is recovered by the dry washing. The writer suggested sinking wells to get the underground water; this has been done and a well 57 feet deep is yielding 326 gallons per minute, which will allow those rich deposits to be worked by the dredge process or by fluming on a small scale, and thus greatly increase the extraction of gold.

J. W. RICHARDS.

The Sweetwater Mining District, Fremont County, Wyoming. By W. C. KNIGHT. *School of Mines, Univ. of Wyoming; Bull. Univ. Geol. Survey*, June, 1901. 35 pp.—The chemical part of this report contains the results of tests made with a view to ascertain the proper mode of treatment of the ores, from which it appears that it is impossible to save a high percentage of the gold by free milling, but that, in general, combinations of processes must be employed. W. F. HILLEBRAND.

Modern Methods of Gold Extraction By W. E. KOCH. *Proc. Eng. Soc. W. Pa.*, January, 1902.—Much remains yet to be done

Digitized by Google

in respect to handling material, automatic appliances, and mechanical improvements before this industry can be called "modernized." Steam stamps are recommended as preferable to gravity stamps, and rope driving preferable to belt driving for the latter. Modern mills do not work much more efficiently than old ones, but put through a vastly greater tonnage. The cyanide process is often combined with amalgamation. The electrical precipitation of gold from cyanide solutions is done by Siemens and Halske by using sheet iron cathodes of 100 square feet surface per ton of solution treated in twenty-four hours, using 4 to 7 volts' pressure, and 0.06 ampere per square foot of surface. This process saves all the float or flour gold, previously, mostly lost. Chlorination is mostly applied to sulphides or tellurides. The sulphur is reduced to 0.1 per cent., or even to 0.03 per cent., by roasting in Ropp or Pearce furnaces, cooled and chlorinated in barrels holding 15 to 20 tons of ore. The modern barrel is of steel plates, 16 feet long by 5 feet in diameter, lined with chemical lead and with a filter firmly secured inside. The extraction is 90 to 98 per cent. Pyritic smelting, using the sulphur of the ores as fuel, is highly recommended when practicable. Hot blast, low charge columns, and continuous charging give the greatest output. Matte is returned to the furnace until it is concentrated to 45 per cent. copper, and then carries all the gold, silver and copper of the ore. A 36-inch smelter will treat 40 tons of charge per day, concentrating 10 or 12 tons into 1, the plant complete costing only $10,000. Concludes that the cyanide process and pyritic smelting have the greatest future for gold extraction.

J. W. RICHARDS.

Progress in the Cyanide Process in 1901. BY J. S. C. WELLS. *Eng. Min. J.*, January 4, 1902.—The use of cyanide solution in the mortars during wet crushing is increasing, the results being satisfactory. The Waldstein or De La Mar patent, covering the use of zinc dust as a precipitant, has been declared invalid by the U. S. District Court of Idaho, and it is probable that the use of this substance will increase as it has some decided advantages over zinc shavings, yielding a much finer bullion at no greater cost, and the precipitation is rapid and complete. The chief difficulty is in making it part of a continuous process. The zinc dust costs 6 to 7 cents per pound; 6 to 9 ounces is used per ton of solution; mills treating over 3,000 tons per day, altogether, are now using it in the United States. J. W. RICHARDS.

Treatment of Exhausted Cyanide Solutions. *Eng. Min. J.*, January 4, 1902.—Copper and zinc accumulate in the solutions, as double cyanides. Such solutions are electrolyzed with zinc anodes and copper cathodes, thereby depositing out the copper and leaving zinc in its place. The solution is made alkaline by a

Digitized by Google

mixture of sodium and calcium hydroxides, and the zinc then precipitated as sulphide, avoiding excess of precipitant. The method is patented by William Orr, of Salt Lake City.

J. W. RICHARDS.

Zinc and Lead Mining in Southwest Missouri. BY F. EBERLE. *Age of Steel*, January 4, 1902.—The Missouri and Kansas Zinc Miner's Association has done much to regulate methods and prices or ore, and has entered into contracts to ship one-fourth of the entire ore product of this section to Europe. The shipments are made in bulk to New Orleans, and thence by steamer to Belgium, and the surplus stocks of ore at the mines are rapidly disappearing. The ore producers are thus largely independent of the domestic smelters, and the price of ore has gone up, thus reviving the mining industry. The ore lands are leased on royalty of 10 per cent. to 20 per cent. of the gross output of ore ; 10 per cent. when the land is unprospected and where no ore has been found, 20 per cent. where the ore has already been found. Outsiders find it best, wherever possible, to buy the land outright. With constantly improving facilities for mining, and the opening up of the larger ore bodies at greater depths, the future zinc and lead outputs of Missouri, Kansas and Arkansas are bound to extensively increase. The Granby Company, for instance, is putting down a 3,000 foot bore hole, at a cost of $15,000, which will probably lead to interesting discoveries regarding the deep deposits.

J. W. RICHARDS.

Concentration Practice. BY R. B. BRINSMADE. *Mines and Min.*, January, 1902.—A description of wet concentration practice as used in Southeast Missouri, to separate galena, and in some cases nickel-cobalt sulphides, from pyrites and limestone. Whether hydraulic sizing or mechanical screening should be used in any case depends on the nature of the minerals in the ore, the closeness of saving profitable, the situation as regards water, fuel and renewals. The St. Joe mill is described as the best example of the *sizing school*, the Central mill as a type of the *screening school*, and the National mill as a combination of the two. The article is well illustrated and gives many valuable details and data.

J. W. RICHARDS.

Progress in Zinc Smelting in 1901. BY W. R. INGALLS. *Eng. Min. J.*, January 4, 1902.—The standard 60 per cent. blende ore, of Missouri contains only 8 per cent. of siliceous gangue; a great deal of ore assays 62 to 63 per cent., and even as high as 64.5 per cent., which is nearly pure blende. The tendency is towards as high concentration as possible. Much attention has been given to removing iron by magnetic concentration; two new machines—the Cleveland-Knowles and the Waring—have given encouraging

Digitized by Google

results. Several new plants have been erected in Missouri, one in Pueblo, Col. Many slight improvements in practice have been introduced, particularly in the line of greater extraction. Smelting with natural gas has developed into a fixed practice, and dates from 1901. Most of the natural-gas furnaces work with forced blast. The distillation furnaces comprise 600 retorts, in five rows of 60 each on each side; the entire gas supply is fed on the sides. The roasting furnaces are either long, mechanically raked furnaces or hand-raked shelf furnaces. Some works utilize the gas for sulphuric acid manufacture. The cost of roasting, using natural gas, is very low. The Sadtler retorts have been introduced at the Midland Smelting Company's works at Bruce, Kansas, and are apparently successful.

J. W. RICHARDS.

Chromium Ore in New Caledonia. *Eng. Min. J.*, January 4, 1902.—Large deposits of ore running 50 to 56 per cent. of sesquioxide are found. The ore can be laid down in New York at $16 per ton for 50 per cent. ore, and $19.50 for 56 per cent. ore.

J. W. RICHARDS.

Nickel Ore in Sudbury, Canada. *Eng. Min. J.*, January 4, 1902.—Several new mines have been opened. The Victoria mines produce 200 tons of ore daily. This is smelted to a matte containing 30 per cent. of nickel and copper, which is raised to 80 per cent. by Bessemerizing, and further treated at the Mond Nickel Company's plant, in two large Mond furnaces. The district produces 1,500 tons of ore per day, which is matted by 12 smelting furnaces, and 2 more are being erected. Refining works are to be erected on the Spanish river, near Massey Station, this year.

J. W. RICHARDS.

Quicksilver Mining in California. BY GEO. A. TWEEDY. *Eng. Min. J.*, January 4, 1902.—The greater mines are, in a measure, worked out; many smaller ones are being discovered. The deposits are irregular, but have been found from one end of the state to the other. As the price of mercury has advanced, great activity has developed. Two large plants have been erected in San Louis Obispo Co., within a year, and one is now producing. It costs $3 to smelt one ton of ore, making it possible to work at a profit ores averaging 0.5 per cent. of mercury, and even lower grades are treated. The mining operations require closer study and attention than any other class of mining, because of the liability of the veins to pinch out. A bulletin on this subject is about to be published by the state mineralogist, Aubury.

J. W. RICHARDS.

Platinum in British Columbia. *Elec. Rev.*, January 4, 1902.—Consul Dudley, of Vancouver, reports that considerable platinum

Digitized by Google

is contained in the gold brought to the assay offices in Vancouver, and believes that large amounts of platinum and kindred metals occur in the placer mining districts of British Columbia and the Yukon Territory. It occurs in black sand containing magnetic iron ore and varying quantities of gold.

J. W. RICHARDS.

Process of Producing Metallic Alloys. *Age of Steel*, December 21, 1901.—W. H. Greene and W. H. Wahl, of Philadelphia, reduce metallic oxides by metallic silicides. Aluminum silicide, or the crude alloy of aluminum and silicon obtained by the electrothermal or electrolytic reduction of crude bauxite or of clay, is useless for ordinary metallurgical purposes, but if mixed with a metallic oxide reduces it with great energy. Lime is added to produce a slag with the silica and alumina formed during reduction. J. W. RICHARDS.

Metallic Nodules in Calcium Carbide. *Elec. Rev.*, January 4, 1902. Guilbert and Dinan have analyzed these metallic buttons, and found them to be principally iron silicide, with small quantities of aluminum and carbon, and traces of manganese, calcium and magnesium. The silicon found was between 18.6 and 28.6 per cent. J. W. RICHARDS.

Hydrogen from Silicides. *Elec. Rev.*, January 18, 1902. Silicides of the alkaline earths are now prepared by reduction of the alkaline-earth salts by carbon in the electric furnace. They are fusible, crystallized products, having the formulas $CaSi_2$, $BaSi_2$, and $SrSi_2$. With water they oxidize, giving a copious supply of pure hydrogen. $CaSi_2$ gives, with dilute acids, "silico-acetylene," Si_2H_2, a yellow, crystalline, non-explosive body.

J. W. RICHARDS.

Alloys of Aluminum and Magnesium. *The Al. World*, January, 1902. Boudouard has studied these alloys with the thermoelectric pyrometer. Starting with pure aluminum melting at 650° C. the melting-point falls as magnesium increases, till with 30 per cent. magnesium it is 432°. Thence it rises to 462°, with 50 per cent., corresponding to the alloy AlMg. With more magnesium it again falls, but again rises to 455°, with 65 per cent. magnesium, corresponding to $AlMg_2$. Thereafter the melting-point falls to 356, with 75 per cent. magnesium, and thence rises to that of pure magnesium 635°. The only true alloys are those above given. The only commercially valuable alloys are those with less than 15 per cent. of aluminum or those with less than 15 per cent. of magnesium; the 50 per cent. alloy is so brittle that it can be pulverized. J. W. RICHARDS.

Electrochemical and Electrometallurgical Industry. By J. B. C. KERSHAW. *Elec. Rev.*, January 11, 1902. Article V.—

Digitized by Google

Description of these industries in Switzerland, Russia, Austria, Italy, Spain, Norway, and Sweden. All are well provided with water-power excepting Russia, the lowest costs being about $12 per H. P. year. The industrial rise of Spain, Switzerland, Italy and Norway, is now assured, because of their utilization of water powers. *Austria* has not made much progress. At Hallein, the Kellner-Partington Paper Pulp Co., bleaches 20 tons of pulp per day, using electrolyzed salt solutions. The 'Consortum für Electrochemischen Industrien' produces at Golling, near Hallein, alkalies, chlorates and bleach, since 1896; according to Kellner's patents. At Jaice, the "Bosnische Elektricitäts Aktein Gesellschaft" has developed 9,200 H. P. from the river Pliva, and has manufactured calcium carbide and alkalies since 1900. The alkali works utilize 1,200 H. P., using Kellner's patents. At Lend-Gastein, the Aluminum Industrie Aktein Gesellschaft of Neuhausen, Switzerland, generates 5,000 H. P., used for calcium carbide and aluminum, but what proportion for each is not known. At Meran, in the Tyrol, the "Acetylen Gas Gesellschaft," has 2,400 H. P. for carbide manufacture, but uses part of it for ferrochrome and similar alloys. At Aussig, the "Oestverein für Chemische Production" has 600 H. P. working on a "Bell" or gravity process for the manufacture of alkalies and bleach, producing 8 tons per day (?) Small copper refineries are operated at Brixlegg and Wittkowitz; there is a small carborundum factory operating the Acheson process at Prague; the Hoepfner electrolytic process of extracting zinc was unsuccessfully tried at Hruschau by the "Oest Soda Fabrik;" and carbide works have been built at Matree, Lobkowitz, Sebenico and Paternion, but are probably not being operated. *Italy:* Calcium carbide works have been built and operated at Tarni, Foligno, St. Martino, Milan, St. Marcel, Salisano, Lugano and Rome. The largest of these is that of the "Societa Italiana Carburo di Calcio" at Collestalle near Terni, where 9,000 H. P. is available, using the Heroult type of furnace. At Papigoni, near Terni, 18,000 H. P. is to be developed, and a carbide works is being erected. The Italian carbide works could more than supply the whole European demand for carbide, hence the industry is demoralized. The alkali industry is not yet in operation. The "Societa Italiana Eletrochimica Volta is building at Bussi, where 2,800 H. P. is available; a company of German, Swiss and Italian capitalists is building at Bellingona, where 18,000 H. P. is to be utilized. The "Societa Italienne d' Electrochimie" has been formed at Turin, but has not yet built works. Chlorates are made at Turgi by the "Gesellschaft für Elektrochemische Industrie," using 600 H. P. The production of iron in electric furnaces was tried on a small scale near Rome, by Captain Stassano in 1899–1900, and a plant of 1,500 H. P. has since been erected at Darfo, in Northern Italy, to utilize 1,500 H. P., and make 4,000 tons of steel per

Digitized by Google

annum. At Rome and Milan electrolytic hydrogen and oxygen are being made on a commercial scale, at considerably less cost than by previous methods. *Norway and Sweden:* Chlorate manufacture is the most successful electric industry. The "Superfosfat Fabrik's Aktiebolag," of Stockholm, started at Mansboe in 1894, with 1,700 H. P. and now use 4,500 H. P., using the Carlsen cell and process. Another factory at Alby has 12,000 H. P. available. At Sarpsfos, 10,000 H. P. is available, the Kellner-Partington Paper Pulp Co., using it for bleaching pulp and making calcium carbide, and the "Aktieselskabet Hafslund" and "Aktieselkabet Karbid-Industrie," producing carbide only, made 1,500 tons in 1900. The "Trollhalten Electriska Kraft Aktiebolag" is reported to have produced 1,500 tons of carbide in 1900; this company is also experimenting on the reduction of iron ores and the direct production of steel. Other carbide factories are at Prebro (3,000 H. P.), Meraker (1,500 H. P.), Kinservik (3,000 H. P.), and at Brottfors. At Askim Falls, fifty miles from Christiania, 45,000 H. P. will be developed, part of which will be transmitted to Christiania and part utilized for electrochemical work. *Russia:* Siemens and Halske operate copper refining at Bogoslousk, in the Urals and at Kedabeg in the Caucasus; Nikolajeff operates one at Moscow. Three factories produce alkali, all situated in the southeastern oil districts. The Bitterfield process is used by the "Akcyjne Fowarzystons Elektrycznon" at Lombkowici, using 1,200 H. P. and producing, in 1900, 3,800 tons of alkali and bleach. At Donetz, the Lubimoff-Solvay Co. are erecting a 1,500 H. P. plant to operate the Solvay mercury cell, which is working very satisfactorily at Jemeppe in Belgium. At Slavianst, the "Elektron" Company, operating the Griesheim process, operate 1,000 H. P. Calcium carbide is made only at Hamekoski Falls, near St. Petersburg, using 2,000 H. P. *Spain:* The "Societa Espanola Carburos Metalicos" utilizes 4,000 H. P. at Berga, for calcium carbide; alkali is produced with 3,000 H. P. at Flix, on the river Ebro, by the "Sociedad Electroquimica de Flix," using the Griesheim "Elektron" process. *Switzerland:* Chlorate was the first electrochemical industry, started by Gall and Montlaur, of Paris, at Villers-sur-Hermes in 1889. The plant was transferred to Valorbes in 1891, where it is operated by the "Société d' Electrochimie" of Paris, using 3,000 H. P., costing $17.30 per H. P. year. Calcium carbide has been made at Neuhausen, Vernayez, Lauterbach, Vernier, Wynau, Hagnek, Thusis, Gampel and Berne, but the first is probably the only one now in operation, leaving much power awaiting profitable employment. Alkalies and chlorine are produced at Chevres, near Geneva, by the "Société Anonyme Suisse de l' Industrie Electrochimique Volta" operating the Outhenin-Chalandre diaphragm process with 1,000 H. P., producing 2,000 tons of products in 1900, and at Monthey-en-Valais by the

Digitized by Google

"Société des Usines de Produits Chimiques" operating the "Elektron" process with 1,500 H. P., producing 3,500 tons of products in 1900. At Orbe, a tannery uses the Groth electric tanning process. *Conclusion:* A summing up of all five articles shows remarkable progress in these industries. An estimate of the power being used in 1900 is 215,000 H. P., and "these new industries may, at no very distant date, represent a greater aggregate of electrical horse-power than all the lighting and traction stations now in existence." J. W. RICHARDS.

Upon the Constitution of Binary Alloys. BY J. A. MATHEWS. *J. Frank. Inst.*, January and February, 1902.—A well-written paper, bringing our information on this subject up to date. The article begins with a historical retrospect, and then describes the modern researches. The crystalline structure of pure metals, the effect of strain upon them, and the cooling curves are next discussed. Then the theory of alloys as solid solutions is set forth, illustrated by references to different kinds of molecular freedom in solids. The phenomena of solidification of binary alloys is then treated *in extenso*, with photographs of pyrometers and apparatus used and curves of various types of binary alloys, with a reference to Roozeboom's discussion of carbon in iron. The bench marks used in calibrating the pyrometer are of interest as exhibiting the most accurate determinations known of several high temperatures, *viz.*, boiling-point of sulphur, 444.53°; melting-point of tin, 232°; aluminum, 654.5°; gold, 1,064°; copper (not oxidized), 1,083°. The second half of the paper discusses the molecular depression of the freezing-point of metals, freezing-point curves of various alloys, many of them published here for the first time; a discussion of what are the true chemical alloys with molecular formulas, the nature of eutectics, and alloys and the phase rule—all very lucidly set forth.

J. W. RICHARDS.

ORGANIC CHEMISTRY.

Derivatives of Pyrimidine. BY W. O. EMERY. *Ber. d. chem. Ges.*, **34**, 4178–4181.—The investigations recorded were begun several years ago, with the object of preparing pyrimidine. In the meanwhile, however, Gabriel and Colman (*Ber. d. chem. Ges.*, **32**, 1534 (1899)) and Gabriel (*Ber. d. chem. Ges.*, **33**, 3667 (1900)) showed how this substance could be obtained from its chlorine derivatives prepared from barbituric acid and methyl uracil. By the action of phosphorus oxychloride, tartronyl urea (dialuric acid) may be converted into the *tetrachlorpyrimidine*, first obtained by Ciamician and Managhi (*Ber. d. chem. Ges.*, **18**, 3444 (1885)) from alloxan. Recrystallized from methyl alcohol, it forms pearly plates, melting at 70°, and possessing a sharp cam-

Digitized by Google

phor-like odor. It is easily soluble in hot alcohol, but only slightly so in cold. It is unaltered by distillation over zinc dust, and does not appear to be attacked by sodium amalgam. Hydriodic acid and phosphorus decompose it, the nitrogen being given off mainly as ammonia. If it is dissolved in absolute alcohol, sodium iodide added, and the mixture boiled for about ten hours. under a return condenser, or, better, if heated in a pressure bottle at 100°, the chlorine is partly replaced by iodine and a mixture of two chloriodopyrimidines results, which can be separated by crystallization from methyl alcohol. The more difficultly soluble substance is thus obtained in needles, m. p. 159°, and is a *dichlordiiodopyrimidine*, $C_4N_2Cl_2I_2$. It is easily soluble in ether, but difficultly so in cold methyl alcohol. It is more readily reduced by zinc dust and water than the tetrachlor derivative. In the mother-liquors from the dichlordiiodo compound was found *trichloriodopyrimidine*. The latter crystallizes from methyl alcohol in yellowish warty masses, m. p. 93°–94°, easily soluble in alcohol or ether. *Tetrabrompyrimidine* was prepared from tartronyl urea in the same manner as the tetrachlor derivative. It forms snowy crystals, m. p. 165°–166°, and is but little soluble in cold alcohol. It is much more difficultly volatile with steam than the corresponding chlorine compound. By the action of zinc dust and water, according to the process of Gabriel and Colman (*loc. cit.*), the tetrachlor derivative was reduced to *pyrimidine* (m. p. 21°), whose *picrate* forms beautiful silky yellow needles, m. p. 156°. M. T. BOGERT.

On the Preparation of Bromoform by Electrolysis. BY PAUL COUGHLIN. *Am. Chem. J.*, **27**, 63–68.—The author has made a thorough systematic study of the preparation of bromoform by the electrolysis of an aqueous solution of potassium bromide, potassium carbonate and acetone. The formation of the bromoform is expressed by the following formula:

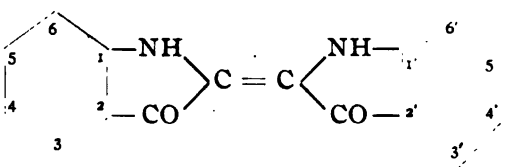
$$6Br + (CH_3)_2CO + H_2O = CHBr_3 + 3HBr + CH_3COOH.$$

The conditions affecting the yield have been carefully worked out and tabulated, showing that by a proper adjustment of temperature, current density, relative amounts of reacting materials, etc., theoretical results may be obtained. In the few experiments in which alcohol was used instead of acetone only a small amount of bromoform was produced, being in no case greater than 10 per cent. of the theory. M. T. BOGERT.

Methyl Derivatives of Indigo. BY M. KUHARA AND M. CHIKASHIGÉ. *Am. Chem. J.*, **27**, 1–15.—The authors have already shown (*Am. Chem. J.*, **24**, 167) that Flimm's synthesis of indigo from bromacetanilide (*Ber. d. chem. Ges*, **23**, 57) may be satisfactorily explained by assuming the formation of diphenyldiketopiperazine as an intermediate product. If this view be cor-

Digitized by Google

rect, substituted acetanilides so constituted as to prevent the formation of a piperazine ring could not yield substituted indigos, and the investigations here recorded were made in order to decide this point, the results fully confirming the correctness of this assumption. As phenylglycocoll can be obtained from diphenyldiketopiperazine by the action of alkali, it is probable that the indigo owes its origin to the further action of the alkali upon this first decomposition product. As by-products in the reactions, phenylisonitrile, primary and secondary amines, and potassium carbonate have been found. The benzene nuclei of indigo are numbered by the authors as follows:



Methylchloracetanilide, $C_6H_5N(CH_3)CO.CH_2Cl$, was prepared by the action of chloracetylchloride upon methylaniline in well cooled ethereal solution. It crystallizes from water in fine needles or large prisms, carrying half a molecule of water of crystallization, m. p., 61°, and which can be sublimed. It attacks the skin slightly. It is completely decomposed by fusion with potassium hydroxide but gives no indigo derivative. *Phenylchloracetanilide* showed the same behavior with potassium hydroxide. *Chloracet-o-, m-, and p-toluides* were prepared in the same way from the corresponding toluidines. The *meta* compound, when crystallized from water, melts at 141°, is somewhat volatile even at ordinary temperatures, and sublimes when heated. From the *ortho* and *para* compounds *ditolyldiketopiperazines* were prepared which readily yielded *dimethylindigos* when fused with potassium hydroxide. Not enough of the meta compound was available for the preparation of a piperazine. *6,6'-Dimethylindigo*, from the diorthotolyldiketopiperazine may also be obtained by fusing the chloracetorthotoluide with potassium hydroxide, contrary to the statement of Flimm. The presence of some potassium carbonate in the melt was found to increase the yield greatly. The melt is treated with water, and the dimethylindigo precipitates in contact with the air. It is purified by washing with hot water and alcohol, subliming at 35–40 mm., and washing the sublimate with alcohol and ether; or, the precipitate may be washed with alcohol, dissolved in hot chloroform and filtered from silica, etc. When pure, it crystallizes in prisms much like ordinary indigo, and yields a bright violet vapor (with partial decomposition) when heated. One gram dissolves in about 2 liters of alcohol or in 300 cc. of chloroform. It is more or less soluble in ether, aniline, benzene, nitrobenzene, oil of turpentine, fused chloral hydrate,

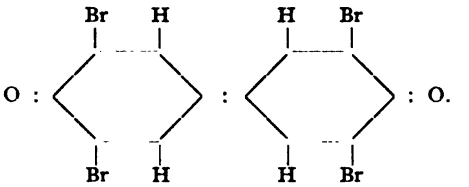
Digitized by Google

paraffin, linseed oil, acetic acid, fuming sulphuric acid, being, in general, more soluble than ordinary indigo. *5,5'-Dimethylindigo* was prepared in similar manner, by fusing chloracetmetatoluide with potassium hydroxide, except that the presence of potassium carbonate in the melt appeared to be of no benefit. It resembles its isomers in its properties, being soluble in alcohol, ether, chloroform, etc. *4,4'-Dimethylindigo* was prepared both from the chloracetparatoluide and from the diparatolyldiketopiperazine, and proved to be identical with the so-called "para dimethyl-indigo" already known. *4,6,4',6'-Tetramethylindigo*, from chlor-acet-unsym. metaxylide or the corresponding diketopiper-azine, resembles in most of its properties the other methyl indigos. *Chloracet-unsym.-metaxylide* crystallizes from benzene in silky needles, m. p. 143°, and does not attack the skin. With alcoholic potash it yields *di-unsym.-metaxylyldiketopiperazine*, which crystallizes in colorless needles, m. p. 170°. *Chloracet-pseudocumidide* crystallizes in needles, m. p. 158.5°. *Dipseudo-cumyldiketopiperazine*, colorless needles, m. p. 221.5. *3,4,6,3',4', 6'-Hexamethylindigo* was obtained in small amount from these pseudocumidine compounds. The solubility of the methyl-indigos in various solvents is given in tabular form. The posi-tions of maximum darkness in their absorption bands in chloro-form solution are also recorded. M. T. BOGERT.

A Study of Tribromphenolbromide. BY J. H. KASTLE. *Am. Chem. J.*, **27**, 31–52.—Tribromphenolbromide was first prepared and studied by Benedikt (*Ann. Chem.* (Liebig), **199**, 127 (1879)), who assigned to it the formula $C_6H_2Br_3(OBr)$. This formula does not satisfactorily explain certain of the reactions of the com-pound, and the investigations recorded in the present paper were begun in 1899 in the hope of throwing further light upon the subject. *Preparation and properties of tribromphenolbromide* (by A. S. Loevenhart). Tribromphenolbromide, prepared by the method of Benedikt, crystallizes from chloroform in beautiful lemon-yellow plates or prisms, m. p. 118°. Its molecular weight, as determined by the cryoscopic method, using ethylene bromide as solvent, was found to be 412.5, the calculated molecular weight being 410. Heated to 130° in a current of carbon diox-ide, one atom of bromine is lost. The residual gummy mass dis-solved in ether and precipitated by alcohol yields a white amorphous substance, the *hexabromphenoquinone* of Benedikt, $C_6H_2Br_3O.OBr_3H_2C_6$. The correctness of this formula was veri-fied by the authors by preparing the same compound from tri-bromphenolbromide and silver tribromphenolate in chloroform solution at the ordinary temperature. Tribromphenolbromide dissolves in carbon bisulphide with a yellow color. This solution decomposes slowly in diffused daylight and quite rapidly in direct sunlight, two atoms of bromine being given off. When this dark

Digitized by Google

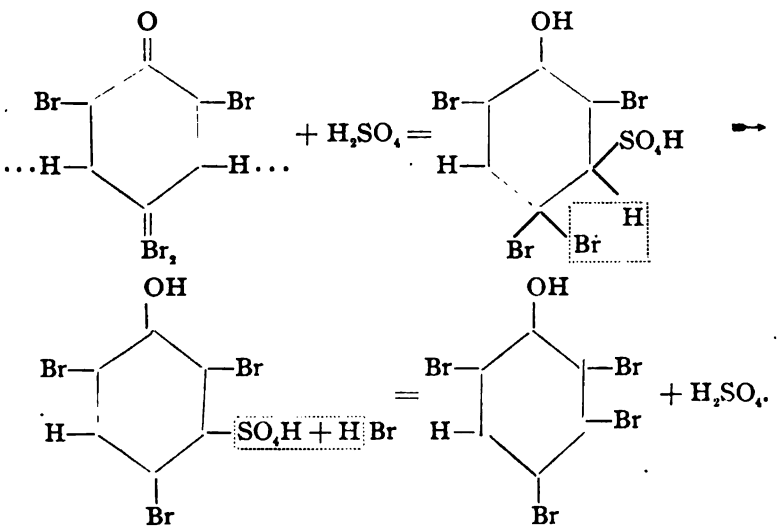
colored solution was distilled at low temperature, a small amount of a *substance* was separated from the gummy residue in the flask which resembled quite closely the hexabromphenoquinone and to which the authors tentatively assign the following formula:



When tribromphenolbromide and water are heated together in a sealed tube at 100° for ten hours, tribromphenol and tetrabromquinone are obtained. Tribromphenolbromide liberates iodine from solutions of potassium iodide; in the absence of water, hexabromphenoquinone is formed, while in presence of water, tribromphenol is the product. In general, when tribromphenolbromide is dissolved in organic solvents it tends towards the production of hexabromphenoquinone, while in aqueous solutions it is more apt to yield tribromphenol. When treated with zinc ethyl, in absolute ether solution, it does not give ethyl tribromphenolate, but ethyl bromide and zinc tribromphenolate. The action of iodine in carbon bisulphide solution produces hexabromphenoquinone. The presence of bromine vapor greatly accelerates the decomposition of tribromphenolbromide, and it should therefore be kept in open vessels so that the bromine slowly separated may pass off.—*Constitution of tribromphenolbromide* (by Rosa Speyer). *Tribromphenylbenzenesulphonate* is readily prepared by the action of sodium tribromphenolate upon benzenesulphonechloride in absolute ether solution; or, still better, by boiling these substances together in absolute alcohol solution and filtering from the separated salt, when the ester crystallizes out upon cooling. It forms colorless glistening rhombic plates, m. p. 99° (uncorr.); it is insoluble in water and in cold alcohol; readily soluble in hot alcohol, benzene, carbon bisulphide, acetone, or ether. It is remarkably stable towards water and other hydrolyzing agents. An attempt to prepare this same sulphonic ester from tribromphenolbromide and sodium sulphinate in carbon bisulphide solution failed, the products of the reaction being hexabromphenoquinone, benzenesulphonebromide and sodium bromide. The formula advanced by Thiele and Eichwede (*Ber. d. chem. Ges.*, 33, 673 (1900),) for tribromphenolbromide should permit a ready transition to metabibromquinone, but the authors failed to obtain the quinone by the action of silver oxide, calcium carbonate, etc. They did accomplish this conversion, however, by boiling with a solution of silver nitrate; of the various reagents used, fuming nitric acid gave the best yield of the quinone.—*The*

Digitized by Google

molecular rearrangement of tribromphenolbromide by sulphuric acid (by J. W. Gilbert). Benedikt has observed that when tribromphenolbromide is heated to 118° with sulphuric acid it is rearranged quantitatively into tetrabromphenol. The authors now find that the same change takes place gradually at the ordinary temperature. This rearrangement could not be accomplished by the use of any other reagent, although many others were tried. *Trichlorphenolbromide* was prepared as follows: Sodium trichlorphenolate was dissolved in water, concentrated hydrobromic acid added to the solution, the pasty mass poured into saturated bromine water, and the mixture shaken and allowed to stand; the bromide separated as a light yellow granular precipitate which, recrystallized from chloroform, showed a m. p. of 97°. Contrary to the statements in the literature, it is not rearranged to trichlormonobromphenol when melted under water, but this change is readily accomplished by the action of sulphuric acid. The authors then proceed to explain the various reactions of tribromphenolbromide by adopting the formula of Thiele and Eichwede together with the hypotheses of the latter concerning partial valency. Thus, the rearrangement caused by sulphuric acid is explained by assuming a dissociation of the H_2SO_4, the H ion changing the quinone O to phenolic OH, while the HSO_4 ion is added directly to the meta carbon; HBr then splits off and attacks the remaining sulphuric ester with formation of tetrabromphenol and regeneration of the sulphuric acid:



Other reactions are explained in similar manner by successive addition and splitting-off processes. M. T. Bogert.

Digitized by Google

BIOLOGICAL CHEMISTRY.

Reversibility of Enzymes, and Its Application to Physiologic and Pathologic Processes. By H. GIDEON WELLS. *J. Am. Med. Assoc.*, February 8, 1902.—Enzyme action is capable of reversibility, so that when proper conditions exist, the products of hydrolytic splitting may be united by the same enzyme that separated them, into the original, more complex molecule. A review of the more important work along this line is given, especially the recent investigations of Kastle and Loevenhart, for which, see *Am. Chem. J.*, **24**, 491; see also abstract of their work in this Review, **23**, 104. F. P. UNDERHILL.

Experiments with Zygadenus Venenosus (Poison Camass.) By REID HUNT. *Am. J. Physiol.*, **6** (Proc. Am. Physiol. Soc., xix).—The chemical and physiological properties of the active principle of *Zygadenus venenosus* agree very closely with those of the mixture of alkaloids known as "veratrine."

F. P. UNDERHILL.

The Venom of Serpents and Antivenomous Serum. *Sci. Am. Suppl.*, **53**, 21,829.—Dry snake poison resembles powdered resin. For experimentation the venom is dissolved in $3^1/_2$ per cent. salt solution. By daily injection of small quantities of this solution into such animals as the horse and dog, the dose being very gradually increased, a serum may be obtained, which, when injected into other animals suffering from snake bite, will do away with all toxic effects. This antivenomous serum has been successfully used in the case of man. F. P. UNDERHILL.

Some New Observations on Blood Plates. By GEORGE T. KEMP AND O. O. STANLEY. *Am. J. Physiol.*, **6** (Proc. Am. Physiol. Soc., xi).—The blood plates on agar-agar containing sodium hexametaphosphate show ameboid movements, as Dutjen (*Virchow's Archiv.*, **164**, 239) has shown. The cells are rich in phosphorus, and are believed to contain nucleo-proteid in the form of granules. F. P. UNDERHILL.

Relation of Blood Plates to the Increase in the Number of Red Corpuscles at High Altitudes. By GEORGE T. KEMP. *Am. J. Physiol.*, **6**, (Proc. Am. Physiol. Soc., xi); see also *Arch. Ital. de Biol*, **36**, Fasc. I.—The count of red corpuscles and blood plates was first made in Paris. The ratio of plates to red corpuscles was 1 to 10.5. The Gorner Grat, Switzerland, 10,290 feet above sea-level, was then ascended, in a railway car, so as to do away with the influence of exertion or fatigue. The count here seventy-two hours after the count in Paris was such that the

Digitized by Google

ratio of blood plates to red corpuscles was 1 to 5.8, an increase of 100 per cent. F. P. UNDERHILL.

On the Question Whether Dextrose Arises from Cellulose in Digestion. BY GRAHAM LUSK. *Am. J. Physiol.*, 6 (Proc. Am. Physiol. Soc., xiii).—It was shown that neither 20 grams of cauliflower fed to a dog diabetic with phlorhizin, nor 10 grams of paper fed to a phlorhizinized goat increased the glucose in the urine. Since glucose fed in phlorhizin diabetes is quantitatively eliminated in the urine, it follows that glucose is not produced from cellulose in digestion. F. P. UNDERHILL.

The Action of Alcohol on Muscle. BY FREDERIC S. LEE AND WILLIAM SALANT. *Am. J. Physiol.*, 6 (Proc. Am. Physiol. Soc., xiii). See also *Arch. Ital. de Biol.*, 36, Fasc. I, 101.—Ethyl alcohol in various percentages was injected into frogs in quantities proportional to the weight of the animal. In small quantities (½ minim of 10 per cent. alcohol per gram of frog), the drug has no effect. Larger quantities (1 to 4 minims of 10 per cent. alcohol per gram of frog) allow the muscle to contract, and relax more quickly, to do a greater amount of work, and to fatigue less easily in a given time, than a muscle without alcohol. In larger quantities than the above, alcohol is detrimental to the muscle and is distinctly poisonous.

F. P. UNDERHILL.

The Excretion of Lithium. BY C. A. GOOD. *Am. J. Physiol*, 6 (Proc. Am. Physiol. Soc., xx).—In experiments on cats, the lithium was injected hypodermically, and was estimated by taking advantage of the insolubility of the phosphate in ammonia solution. The dose of 0.5 gram was found fatal, the animal dying after a week. When 1 to 2 grams were given hypodermically, very considerable amounts were found in the stomach, the bowel, and in the saliva. In fatal poisoning, more was found in the stomach and bowel than in the urine. When small doses were given repeatedly, more lithium was excreted in the urine than by the alimentary canal. F. P. UNDERHILL.

Experiments on the Relation between the Spleen and the Pancreas. BY LEO. F. RETTGER. (Presented by L. B. MENDEL.) *Am. J. Physiol.* 6 (Proc. Am. Physiol. Soc., xiv).—The specific effect of intravenous injections of spleen extracts is to augment the trypsin content of the pancreas of splenectomized dogs. F. P. UNDERHILL.

Experiments on Allantoin Excretion. BY LAFAYETTE B. MENDEL. *Am. J. Physiol.*, 6 (Proc. Am. Physiol. Soc., xv).—Thymus glands, finely divided, mixed with water and introduced *per rectum* into dogs, cause an excretion of allantoin, and an in-

Digitized by Google

creased excretion of uric acid in the urine eliminated during the succeeding day. The absorption of the "purin" constituents of the glands is thus demonstrated. Nucleic acid and nucleates, obtained by Osborne's method from wheat germs, when fed to a cat, on a diet free from these compounds, cause an excretion of allantoin in the urine. These vegetable nucleates thus resemble the nucleo-proteids from animal tissues. F. P. UNDERHILL.

The Role of the Cell Nucleus in Oxidation and Synthesis. BY R. S. LILLIE. (Presented by W. T. Porter.) *Am. J. Physiol.* **6** (Proc. Am. Physiol. Soc., xv).—Sections of fresh and alcoholic tissues of the frog were treated with an alkaline solution containing para-diamino-benzene and α-naphthol. This solution, first colorless, turns violet on oxidation from the formation of indophenol by condensation. In general, the coloration is intensest and appears soonest in those organs and in those regions of organs which contain the most numerous and most densely aggregated nuclei. The oxidation and synthetic activity of organs like the kidney and liver depend upon the great extent of nuclear surface. F. P. UNDERHILL.

The Composition and Chemical Qualities of the Albumoid in Bone. BY P. B. HAWK AND WILLIAM J. GIES. *Am. J. Physiol.*, **6** (Proc. Am. Physiol. Soc. xxvii).—Samples of osseoalbumoid were prepared from ossein by the method of Mörner. A comparison of the average elementary composition of osseoalbumoid, keratin and elastin follows:

	C.	H.	N.	S.	O.
Osseoalbumoid	50.03	6.85	15.93	0.55	26.64
Ligament elastin	54.08	7.20	16.85	0.30	21.57
Hair keratin	50.65	6.36	17.14	5.00	20.85

F. P. UNDERHILL.

A Comparative Study of the Reactions of Various Mucoids. BY L. D. MEAD AND WILLIAM J. GIES. *Am. J. Physiol.*, **6** (Proc. Am. Physiol. Soc., xxviii).—By the digestion of osseomucoid, chondromucoid, and tendomucoid with pepsin-hydrochloric acid, proteoses, and peptones are formed, together with a nitrogen-containing substance, rich in reducing material, probably chondroitin sulphuric acid. The microscopic appearance of the phenylosazone bodies obtained from each is the same as that of glucosazone, indicating glucosamine among the products of acid hydration. The connective tissue mucoids are practically identical substances. F. P. UNDERHILL.

Studies in Diuresis. BY J. T. HALSEY. *Am. J. Physiol.*, **6** (Proc. Am. Physiol. Soc. xvi).—Nussbaum's experiments on the circulation in the frog's kidney with their importance in explaining diuresis, failed to receive anatomical confirmation when Adami recently repeated these experiments. Halsey's experi-

Digitized by Google

ments, however, give results in entire concordance with those of Nussbaum. F. P. UNDERHILL.

On Saline Diuresis. BY ARTHUR R. CUSHNY. *Am. J. Physiol.*, 6 (Proc. Am. Physiol. Soc., xvii). See also J. Physiol., 27, 429–451.—On the injection of sulphate and chloride of sodium intravenously, the sulphate and the chloride increase in the urine along with the fluid. As the diuresis decreases, the chloride falls much more rapidly than the sulphate, which increases in percentage This may be explained by the chloride and water being absorbed, while the sulphate permeates the tubules less readily. F. P. UNDERHILL.

Are Proteids Which Are Prepared by the Usual Methods Combined with Fat or Fatty Acids? BY E. R. POSNER AND WILLIAM J. GIES. *Am. J. Physiol.*, 6 (Proc. Am. Physiol. Soc., xxix). "Chemically pure" connective tissue, mucoids, and albuminoids were analyzed, according to Nerking's methods, with negative results. The mucoids and albuminoids, as they are prepared to-day, are not "fat-proteid compounds."
F. P. UNDERHILL.

On the Toxicology of Selenium and Its Compounds. BY I. O. WOODRUFF AND WILLIAM J. GIES. *Am. J. Physiol.*, 6 (Proc. Am. Physiol. Soc., xxix).—Selenium is more toxic than tellurium although its poisonous effects are qualitatively much the same. The expired methyl compound of selenium is produced in much less quantity than that of tellurium under similar conditions. Selenium, although chemically related to sulphur, is very much like arsenic in its toxic effects. F. P. UNDERHILL.

The Influence of Temperature, Odors, Light, and Contact on the Movements of the Earth Worm. BY AMELIA C. SMITH. *Am. J. Physiol.*, 6, 459–487.—*Allolobophora foetida*, the common manure worm, was used in these investigations. A rise of temperature of 10° above that in which a foetida lives does not cause a retreat of the worms. A rise of 29° to 35° C. causes retreat, while a rise of 35° to 40° is usually fatal. While not stimulated by odors at a distance from the body, the animals possess a sense of smell. This animal also possesses a marked thigmotactic response. F. P. UNDERHILL.

Causes of Muscle Fatigue. BY F. S. LEE AND W. SALANT. *Arch. Ital. de Biol.*, 36, *Fasc.* I, 101.—Of the two recognized causes of muscle fatigue, *viz.*, loss of substances necessary for contraction and poisoning by so-called fatigue products, special attention in this paper is given to an investigation of the former. The most important results have been obtained in the study of the effects of prolonged administration of phlorhizin to cats.

Digitized by Google

Various considerations make it probable that when a muscle becomes fatigued it passes from the *fresh* stage, first into a stage of simple fatigue, due chiefly to the accumulation of *fatigue* products and, later, into the stage of advanced fatigue or *exhaustion*, due chiefly to the loss of carbohydrates.

F. P. UNDERHILL.

Rigor Mortis. BY F. C. LEE AND C. C. HARROLD. *Arch. Ital. de Biol.*, 36, *Fasc.* I, 102.—The prolonged administration of phlorhizin to cats causes the muscles to pass into rigor mortis within a few minutes after death. If, before death, glucose be given to such phlorhizinized animals, the oncoming of rigor is delayed. The conclusion seems justified that the absence of carbohydrates is favorable to, its presence unfavorable to, the development of rigor mortis. F. P. UNDERHILL.

On a Simple Method of Preparing Epinephrin and Its Compounds. BY JOHN J. ABEL. *Bull. Johns Hopkins Hospital, No.* 13, 29–36.—The blood-raising constituent of the suprarenal gland may be isolated by the method described in this paper in the form of a basic crystalline, though unstable compound which agrees in some of its properties with the substance called epinephrin, while it fails to exhibit certain other equally fundamental and characteristic properties of this substance. Mineral acids, however, easily convert this substance into one which is physiologically active and which also gives all the characteristic reactions of epinephrin, $C_{10}H_{11}NO_3$. Highly soluble and apparently stable salts of therapeutic and chemical importance are easily made.

F. P. UNDERHILL.

On the Formation, Decomposition and Germicidal Action of Benzoyl Acetyl and Diacetyl Peroxides. BY PAUL C. FREER AND FREDERICK G. NOVY. *Am. Chem. J.*, 27, 161–193.—Benzoyl peroxide has no germicidal action. Acetyl peroxide and benzoyl acetyl peroxide may also be considered as chemically and biologically inert, but unlike benzoyl peroxide, they readily undergo hydrolysis with the production of intense oxidizing, and actively germicidal bodies. These bodies are benzoperacid, $C_6H_5.CO.O.OH$, and acetoperacid, $CH_3.CO.O.OH$. When the effects of these organic peroxides are tested upon bacteria and their effects compared with those of hydrogen peroxide it is seen that the former are several hundred times greater than the latter.

F. P. UNDERHILL.

PHARMACEUTICAL CHEMISTRY.

Scopola versus Belladonna. BY A. B. PRESCOTT AND J. O. SCHLOTTERBECK. *Bulletin of Pharmacy*, 16, 55.—This comparative investigation is a part of a series of scientific inquiries being

Digitized by Google

made at the instigation of the American Pharmaceutical Association for the purpose of possibly recommending the substitution of the more abundant and cheaper scopola root for belladonna root, especially in the manufacture of plasters.

The total alkaloidal product of a large quantity of authentic crude drug scopola and belladonna was extracted with unusual care by a well-known chemist in order to avoid hydrolyzation or saponification of the alkaloids and supplied to the authors. This crude product was purified with care and the individual bases isolated as far as possible. The conclusion was reached that hyoscyamine constitutes the greater portion of the alkaloids of scopola. Varying proportions of hyoscyamine and atropine constitute the predominating alkaloids of belladonna, with the former in excess in this particular lot of drug. Combustions were made, gold and platinum double salts prepared and the optical rotation determined. Hyoscyamine gave a rotation of $[\alpha]_D = -21.43°$. Atropine was finally obtained optically inactive. The proportions of hyoscyamine and atropine in a mixture was determined by the optical rotation.

The pure alkaloids are being compared pharmacologically upon the lower animals to ascertain whether one alkaloid can be substituted for the other. J. O. SCHLOTTERBECK.

Chelidoxanthin Is Probably Impure Berberine. BY J. O. SCHLOTTERBECK. *Pharmaceutical Review*, **20**, 4.—The author believed at the time the work on Stylophorum (This Journal, **24**, 1) was in progress that the coloring-matter chelidoxanthin was nothing more or less than berberine but the quantity at his disposal was so small that sufficient confirmatory tests could not be made. Therefore he said nothing of berberine in his paper. Since then a much larger quantity of the drug has been extracted and about 15 grams of this substance isolated. In color, taste, behavior with chlorine water; solubility in water, alcohol, amyl alcohol, methyl alcohol, acetone, and chloroform; insolubility in ether, benzol, toluol, and acetic ester; solubility of the nitrate, hydriodide, hydrochloride, and sulphate in hot and cold water; and in its power to decompose chloroform forming a hydrochloride of the base, the crystalline compound separated from Stylophorum diphyllum coincides with the alkaloid berberine. Furthermore, the insoluble, crystalline berberine-acetone and from it Gaze's so-called free berberine (berberine hydrochloride) is easily obtained.

Fresh plants of Stylophorum growing in the botanical garden yielded the same compound. It answers the description of chelidoxanthin obtained from the related Chelidonium majus. Therefore, it is believed, that chelidoxanthin is only impure berberine. Fresh plants of Chelidonium are being examined for berberine. J. O. SCHLOTTERBECK.

Digitized by Google

SANITARY CHEMISTRY.

Sewage Purification—Second Experiment with Septic Tank at Pawtucket. By G. A. CARPENTER. *The Monthly Bulletin, State Board of Health*, Rhode Island, 13, 72–74; *Eng. News*, 47 (1902), 178.—A second experiment with the septic tank was concluded in August, 1901. The experiment was begun November 20, 1900, and ended August 12, 1901. During this period, 29,420,303 gallons of sewage had passed through the tank, and the amount of solid matter arrested by the passage of sewage, as shown by the determination of total solids in sewage and effluent, equalled 48.29 cubic yards dry solid matter. The amount of organic matter removed from the sewage, calculated from the albuminoid ammonia, equalled 43 per cent.

From January 1, 1901, careful measurements of the solid constituents in the tank were made each month. There was a gradual increase in the amount of solid matter up to April 1st, and all the accumulation, with the exception of a small amount of scum, was at the bottom of the tank.

When the measurement was made May 1st, the accumulations were found to be almost entirely on the top, and the total amount of solid matter was less than in April. From this time the solid matter again continued to increase, but little being deposited at the bottom of the tank, the accumulation taking place on top.

The amount of solid matter arrested by the passage of the sewage through the tank, which was liquefied or changed into gas, equalled 47 per cent. LEONARD P. KINNICUTT.

The Purification of Sewage by the Septic Tank and Various Supplementary Processes. By W. S. SHIELDS. *Eng. News*, 47 (1902), 95.—The author believes that the septic tank has passed from the experimental stage and is now an important principle in the purification of sewage, but that too much must not be expected from it. It is not a complete process in itself, only a preparatory step.

As to contact beds he thinks that experience has demonstrated that contact beds, when properly controlled and managed, give excellent results, but there is danger of their falling into discredit from lack of proper and skilled management.

As to the construction of septic tanks, he doubts if there is much merit in the submerged inlet and outlet, and states that he has obtained the best results when the inlets were on the surface. He is also doubtful if there is any advantage in using air-tight tanks, either in increased efficiency or in the prevention of obnoxious odors, and favors masonry tanks, with interior divisions

Digitized by Google

for different times of passage, enclosed in a low brick building, walls six feet high, and covered with a wood gable roof, containing good-sized ventilators.

The paper also contains a decription of two plants constructed by Mr. Shields, one at Wauwatosa, Wis., for treating 100,000 gallons per day, the other at Lake Forest, Ill., for treating 200,000 gallons per day.

He states that at Wauwatosa the beds continued to work when ice from six to eight inches thick had formed on the surface of the beds. LEONARD P. KINNICUTT.

The Pittsburg Water Purification Works. *Eng. Record*, 45 (1902), 73–77.—A description with drawings of the water filtration plant to be constructed at Pittsburg, Pa.

The plant is to consist of a pumping station, two sedimentation basins holding 50 million gallons, twenty-five one acre open slow sand filtration beds, and a closed pure water reservoir. The sand filtration beds are separated into three groups, each supplied from a single controller house; and two of the three groups are further subdivided into two sets by employing two regulator houses in each group, where the rate of flow from the system of underdrains are regulated. This arrangement differs materially from the sand filters at Albany and Philadelphia, and is one of the most striking features of the work. On the floor of the filters and surrounding the underdrains is to be placed gravel or broken stone to the average depth of 1.1 feet, the lower 9 inches of a diameter from 1 to 2 inches, the next 2 1/2 inches of a diameter of three-eighth to 1 inch, the upper 2 1/2 inches of gravel which passes a three-eighth inch mesh, but coarser than the filter sand.

The filter sand is to be sand entirely free from clay, dirt, coal, or organic matter, and not to contain over one per cent. of lime and magnesia taken together and calculated as carbonates. Of this filter sand, not more than one-half of one per cent. by weight shall be less than 0.13 millimeter; not more than seven per cent. less than 0.26 millimeter. At least seven per cent. by weight shall be less than 0.34 millimeter; at least seventy per cent. less than 0.83, and at least ninety per cent. less than 2.1 millimeters. No particles shall be more than five millimeters in diameter.

LEONARD P. KINNICUTT.

The Septic Tank System at Fond Du Lac, Wis. BY GEO. S. PIERSON. *Eng. Record*, 45 (1902), 176–177.—The system consists of a pumping station, septic tanks, and four contact beds.

The septic tank is 96 x 48 feet, divided into two compartments, and when in operation the sewage will stand at a depth of nine feet. At the further end of the tank there are twenty-four outlets, one foot ten inches below the surface of the liquid in the tank.

The beds are 119 1/2 x 46 1/2 feet at bottom, 15 feet wider and

Digitized by Google

longer at top, filled to a depth of 3 1/2 feet with cinder. The effluent from the septic tank can either be run directly into the river or upon the beds. LEONARD P. KINNICUTT.

An Investigation of the Boston Ice Supply. BY DR. HIBBERT W. HILL, Director of the Boston Board of Health Bacteriological Laboratory. *Boston Medical Journal*, 145, 557–561.—The total amount of ice sold in Boston annually is estimated at 300,000 to 400,000 tons, representing 75 to 100 million gallons of water, which is only about three times the amount of water used daily in Boston. The ice supply is derived from 24 ponds and the Charles River, all within 30 miles of Boston, and from 4 ponds in New Hampshire. The sources of supply were visited by Dr. Hill and Mr. Jordan, the chief sanitary inspector, and the ice houses were visited, and samples from each analyzed by Mr. Rickards, assistant bacteriologist. From these analyses and from the work done by Sedgewick, Winslow and Park, on the reduction of typhoid bacilli in water by freezing, Dr. Hill draws the following conclusions as regards danger from infection through ice.

On theoretical grounds the danger of infection through ice is very small. Practically, and under the conditions of the present Boston supply, danger of inflection through natural or artificial ice is almost nil. It is not greater than that involved in drinking the Boston tap water, and it is certainly infinitely less than that involved in drinking milk. Careful search of the records has shown that but one presumably authentic case of transmission of typhoid fever through ice is on record. This occurred in France, and resulted from the use in wine of ice taken from a river below the sewage outlet of a town. The fact that there is such a case shows the possibility of such infection ; the fact that there is only one shows its extreme rarity. In this country typhoid fever has been attributed to ice in one instance in Connecticut, the evidence being extremely indefinite. In 1876 an outbreak in this country (not claimed to be typhoid, and from the description of very uncertain character) was attributed to ice on grounds which would not in these days be accepted as at all trustworthy.

LEONARD P. KINNICUTT.

The Sewerage and Sewage Disposal of Burton upon Trent. BY J. W. SMITH. *Eng. Record*, 45 (1902), 81–85.—The sewage of Burton is unique in character, two-thirds of the total amount being the waste liquor that comes from the breweries, containing large quantities of spent hops, seeds, dead yeast, and sulphurous acid used by the brewers in washing out their various vessels. The method of sewage treatment is "Sewage farming," but the crude sewage cannot be applied directly to the land, on account of the amount of sulphide of hydrogen that is evolved, as the

Digitized by Google

putrescible substances in the sewage undergo decomposition.

To prevent the evolution of sulphide of hydrogen the sewage is first treated with milk of lime, the amount averaging about forty grains to the imperial gallon, but depending on the flow and character of the sewage. To determine the exact amount to be added, the sewage is tested every quarter of an hour, day and night, by taking one gallon and adding to it forty grains of lime. This is thoroughly shaken and allowed to stand for five minutes. An acetate of lead paper is then suspended in the bottle for five minutes; if the paper is not discolored, the sewage is considered to be normal, and is treated to forty grains per gallon in the ordinary way; if, however, the paper is discolored, more lime is added until the paper ceases to be discolored, and the number of grains per gallon necessary to effect this is telephoned to the pumping station, where lime is added accordingly. To check the accuracy of these tests, similar tests are made at the pumping station from the suction culvert, after the lime has been added and thoroughly mixed with the sewage by the agitator. Finally, similar tests are made hourly with the sewage when delivered upon the farm.

Although a fairly good effluent is obtainable by the present system of intermittant filtration, the reduction of albuminoid ammonia being considerable, no nitrification takes place. It would seem that the peculiar character of the sewage entirely prevents this. Many experiments have been tried in order to produce an effluent containing nitrates or nitrites, but without success; among others was a rough laboratory experiment of the septic tank process, but this failed in its object.

LEONARD P. KINNICUTT.

The Sewerage Systems of Sydney, N. S. W. By J. DAVIS. *Eng. Record*, **45** (1902), 158–159.—Sydney is noteworthy for the number and variety of the sewage and sewage disposal systems recently constructed within its limits.

There are three main drainage areas, the Northern, Southern, and Western. The sewage of the Northern drainage area, 8000 acres, is discharged into the ocean. The sewage of the Southern drainage area, 1300 acres, after screening and chemical precipitation, is treated by intermittent filtration on a suitably prepared sandy area of 300 acres. The sewage of the Western area, the present population of which is 210,000, and the calculated prospective population 420,000 is treated by intermittent downward filtration, the effluent passing into tidal waters.

The sewage of North Sydney, Mosman, and Willoughby, prospective population 80,000, is treated by precipitation and intermittent filtration.

The sewage of the Rockwood Asylum, 50,000 gallons daily is treated by the English method of septic tanks and contact beds.

Digitized by Google

This has been so successful that a similar plant has been erected at Chatswood, a large northern suberb, consisting of three septic tanks each of 107,000 gallons capacity, and four contact beds.

LEONARD P. KINNICUTT.

The Recent Epidemic of Typhoid Fever at Baraboo, Wis., and Its Probable Relation to Water Supply. BY W. G. KIRCHAFFER. *Eng. News*, 47 (1902), 166–167.—An epidemic of typhoid fever at Baraboo, Wis., occurred in May and June, 1901, and was apparently traced to the water supply.

One of the sources is an artesian well; the suction pipe from this well crossed a raceway connected with the Baraboo river, a river which receives the drainage of the town. It was shown, on investigation, that there were leaks in the suction pipe, and consequently the water supply was contaminated with river water. The author draws the conclusion that it is not safe to run a pure water main through polluted waters with no other protection than a lead joint, especially when heavy machinery is apt to be jarring and pulling upon such a pipe. LEONARD P. KINNICUTT.

A Portable Outfit for Water Analysis. A. G. WOODMAN. *Technology Quarterly*, 14, 295–301.—A description of a simple portable outfit for making a preliminary examination as to the purity of a water with a list of apparatus and reagents required, and a description of the tests to be made.

LEONARD P. KINNICUTT.

INDUSTRIAL CHEMISTRY.

Artificial Graphite. BY FRANCIS A. J. FITZGERALD. *Eng. and Min. J.*, March 1, 1902.—The Acheson process for the manufacture of carborundum (silicon carbide) has been modified so as to produce an artificial graphite as the main product. To this end the carbonaceous materials have added to them, in advance, mineral matter such as oxide of iron, etc., so as to form metallic carbides which are then dissociated at a higher temperature leaving the carbon behind in the form of a very pure graphite. Thus in making graphite electrodes a mixture is made up of petroleum coke, and pitch, like an ordinary carbon for arc lights but some carbide-making material such as silica or iron oxide is introduced. The electrodes are baked in the usual way and then graphitized by heating to a temperature well above that of the volatilization of iron, aluminum and silicon. In manufacturing graphite for other purposes, such as crucibles, paint, stove polish, etc., anthracite coal is usually employed. The physical changes produced in this graphitization of electrodes are shown in the following figures:

Amorphous carbon electrodes: density, 1.90; electrical resist-

Digitized by Google

ance per cubic inch, 0.00124 ohm; graphite electrodes: density, 2.19; electrical resistance per cubic inch, 0.00032 ohm.

The electrodes show a marked resistance to disintegration in the electrolysis of sodium chloride solutions, having from two to three times the life of retort carbon, and from three to seven times the life of artificial carbon electrodes. S. P. SADTLER.

Ammonal, a New High Explosive. BY G. ROTH. *Sci. Amer. Suppl.*, February 8, 1902.—This is the name of a new high explosive which it is claimed is both safe and powerful. It is not a nitro derivative at all, but a mechanical mixture of ammonium nitrate and aluminum. It is less liable to absorb moisture than other powders of its class and keeps well when properly packed. When used either in mines or in ordinance both safety and enormous power are obtained. So far as its industrial use is concerned, the most striking feature of the explosive is the total absence of noxious gases, which renders it especially fit for blasting in pits and quarries. It can be brought to complete detonation by a simple black powder priming. But if a fulminate detonator is considered preferable, as in torpedo charges, or submarine mines, 1 gram of fulminate is all that is required.

S. P. SADTLER.

Slag Cement Manufacture in Alabama. BY EDWIN C. ECKEL. *Eng. News*, January 23, 1902.—The author describes two slag cement plants, that of the Birmingham Cement Co., at Ensley, and that of the Southern Cement Co., at North Birmingham. The two ingredients in the cement are a basic slag approximating $2SiO_2$, Al_2O_3, $3CaO$, in composition, and slaked lime. The slag is first granulated and thoroughly dried; it is then mixed with lime and lastly thoroughly pulverized. The resultant product belongs to the class of puzzuolaunic cements as distinguished from either natural or Portland cements, both of which are calcined. The "Alabama Portland" brand of cement averages about 55 per cent. of lime, 12 per cent. oxide of iron, and alumina, and 27 per cent. silica. S. P. SADTLER.

Gutta Percha in the Philippines. BY MAJ. J. ORTON KERBY. *Elec. World*, February 1, 1902.—The author, who had previously studied the supplies of rubber and gutta percha on the Amazon, has made a report to the War Department on the gutta percha found in Mindanao. He finds that large quantities of gutta percha have been shipped for years past from Mindanao to Singapore, by Chinese merchants, and sold as from Singapore. He states that Great Britain and Holland are the countries owning all the known gutta percha lands outside of the Philippines. They are taking active steps not only to preserve the trees but to establish new plantations. Germany is arranging to introduce trees in her African and New Guinea possessions, and France also

Digitized by Google

has sent agents to visit her tropical possessions for the same purpose. It is expected that the new Philippine Agricultural Department recently established will look after the same interests in the future for the United States. S. P. SADTLER.

The Action of Chromates and Bichromates on Colloids (Gelatine, Albumen, Gums, Etc.). BY PROF. R. NAMIAS. *Sci. Amer. Suppl.*, February 8, 1902.—The author considers that the well-known power of alkaline chromates and bichromates of rendering colloid bodies insoluble after exposure to light is due to the partial reduction of the chromate or bichromate to a salt of chromium (chromium chromate) which combines with the colloid to form an insoluble compound and not to any combination of chromium oxide itself with the colloid. While in actual practice potassium or ammonium bichromate are used indifferently, the author finds that the ammonium salt is distinctly the more active. This difference the author ascribes to the volatility of the base, as the whole of chromium trioxide can be made effective in the case of the ammonium salt while when the potassium salt gives up its excess of chromium trioxide it leaves a neutral chromate of potassium which is almost unaffected by light. On the other hand, neutral chromate of ammonium is effective, although not in the same degree as the bichromate. The author advises the use of neutral ammonium chromate (or ammonium bichromate to which aqua ammonia has been added), however, as it is more soluble. Thus a solution with a concentration of 25 per cent. can be prepared with it while with potassium bichromate only an 8 to 10 per cent. solution can be prepared, and with ammonium bichromate only 12 to 15 per cent. solutions. The author has found that casein, a colloid not previously reported upon, can be rendered insoluble with both neutral and alkaline solutions after mixing with ammonium chromate and exposure to light.

S. P. SADTLER.

Substitute for Alkalies in Developers. BY LUMIERE AND SEYEWITZ. *Phot. Era*, February, 1902.—Messrs. Lumiere and Seyewitz have studied the action of acetone as a substitute for alkali in developers and have shown that in the presence of sulphite of soda, acetone brings out the latent image as well as the alkalies. Acetone, sulphite of soda and water together have no action upon an exposed plate, but upon adding a developer, their action begins at once. The following formula is given as the best: Water, 100 cc.; sulphite of soda (anhydrous), 5 grams; acetone, 10 grams; pyro, 1 gram.

The color of the reduced silver is a warm black and not the blue-black given by diaminophenol, and is permanent. Formaldehyde acts in the same way as acetone but the results are not so satisfactory. With hydroquinone, formaldehyde, however, gives good results. S. P. SADTLER.

Digitized by Google

Manufacture of Citric Acid. By J. Ohly. *Pharm. Era*, **26**, 706.—In the manufacture of citric acid from lemons, the author suggests that first a sodium salt be made, and then convert this into the calcium salt by means of calcium chloride. In the usual manner the acid can be purified by decomposing this calcium salt.
J. O. Schlotterbeck.

The Dutton, Rattlesnake, Arago, Oil Mountain, and Powder River Oil Fields. By W. C. Knight and E. E. Slosson. *The School of Mines, Univ. of Wyoming. Petroleum Series—Bull. No.* 4, *April, 1901.* 57 pp.—In the chemical part of this paper are given the results of density, sulphur, solution, and distillation tests, with conclusions as to the adaptability of several of the oils for technical purposes. W. F. Hillebrand.

The Beaumont (Texas) Oil Field. By F. W. Greer. *Age of Steel*, January 4, 1902.—The Lucas gusher started January 10, 1901, throwing a 6-inch stream 150 feet in the air, blowing out 400 feet of pipe, and is conservatively estimated to have produced 700,000 barrels of oil in the ten days before it was capped. The property on Spindle Top Hill fell into the hands of at least 400 different owners, and now presents a scene of closely packed derricks rivaled only at Balakhany near Baku, in the Caucasus. There are now 3 pipe lines from the field to deep water, and the pressure is sufficient to load the oil into the vessels. Nearly $4,000,000 has been spent in prospecting, construction and labor. The oil field is only 200 acres in extent, on which are 193 wells, of 4- to 10-inch pipe, producing each 40,000 to 110,000 barrels per day. The 'hill' is only 8 feet higher than the surrounding plain. The pressure and producing powers of the wells are keeping up, and the production for 1902 will surpass all the ideas of the general public; it will be a greater tonnage than the total cotton and wheat crop of the United States. Oil sells now at an average price of 20 cents per barrel at the field, its large use on railroads and in smelting works will change very greatly the fuel question in the southwest. J. W. Richards.

AGRICULTURAL CHEMISTRY.

Field Operations of the Division of Soils, 1900 (Second Report). By Milton Whitney, *et al.* U. S. Dept. Agr., 1901. pp. 474.—This report contains a general review of the field and laboratory work of the Division of Soils during 1900, by the chief of division; twelve detailed reports of soil surveys of districts located in Pennsylvania, Ohio, Maryland, North Carolina, Utah, Arizona, and California; reports of laboratory investigations supplemental to the field operations; and the results of experiments with tobacco conducted in various parts of the United

Digitized by Google

States. The report is illustrated by 51 plates and 47 text figures, and is accompanied by 24 maps.

The total area mapped during 1900 was 4,465 square miles, which was surveyed at an average cost of $1.97 per square mile. The topography, geology, climate, agricultural conditions, etc. of the different areas are presented in the several reports noted below. In all, 397 mechanical analyses of soils and subsoils are reported in tabular form as well as numerous analyses of alkali and of irrigation waters.

A soil survey around Lancaster, Pennsylvania, is reported by C. W. Dorsey. The district surveyed covers about 270 square miles and was selected as being one of the most important tobacco-producing districts in the state. Eleven types of soil are described, of which the Hagerstown loam and the Conestoga loam are the most important and occupy over one-half of the area.

A soil survey of Montgomery County, Ohio, is reported by C. W. Dorsey and G. N. Coffey. This county covers 480 square miles and is also an important tobacco-producing district. The soils are all of glacial origin, six types being recognized. The Miami clay loam, a light soil of uniform texture and composition, is the most important soil formation and covers nearly 80 per cent. of the county.

A soil survey of Cecil County, Maryland, is reported by C. W. Dorsey and J. A. Bonsteel. This district covers about 375 square miles and is divided into two distinct areas in each of which are five types of soil varying in character from almost barren to highly productive.

Soil surveys of St. Mary, Calvert, and Kent Counties, Maryland, are reported by J. A. Bonsteel and R. T. A. Burke. These counties, bordering on Chesapeake Bay, lie wholly within the Coastal Plain and have areas, respectively, of 360, 218, and 315 square miles. Nine types of soil, rarely occurring in continuous tracts, were recognized in St. Mary and Calvert Counties, and 7 in Kent County. The soil types included loam, gravel, sand, clay, and swamp.

A soil survey of an area about 9 miles wide and 105 miles long, extending from Raleigh to Newburn, North Carolina, is reported by W. G. Smith. A great variety of soils was met with, seventeen types being recognized. The soils include a strong clay adapted to wheat and grass, a silt loam well suited to tobacco, a sandy soil typical for truck farming, and a stony loam nearly worthless.

A soil survey in Weber county, Utah, is reported by F. D. Gardner and C. A. Jensen. This district lies between the Great Salt Lake and Wasatch mountain and has an area of about 310 square miles. Eight types of soil are described, the most important of which, agriculturally, is the Fresno fine sandy loam covering about 43 per cent. of the area. A considerable portion of the district has, until recent years, been covered by the Great

Digitized by Google

Salt Lake and contains excessive quantities of alkali. Chemical analyses of alkali crusts from nine localities indicated an average composition of 59.83 per cent. of sodium chloride, 11.10 per cent. sodium carbonate, 10.24 per cent. sodium bicarbonate, 12.20 per cent. sodium sulphate, 4.39 per cent. potassium chloride, 1.24 per cent. magnesium sulphate, and 1 per cent. calcium sulphate. The authors dwell upon the formation and treatment of hardpan and the reclamation and utilization of waste lands.

A soil survey in the Sevier Valley, Utah, is reported by F. D. Gardner and C. A. Jensen. The valley has an average width of about 5 miles and was surveyed for a distance of 45 miles. The soils being well drained and carefully irrigated are to a large extent free from injurious quantities of alkali. Ten types were recognized. The average composition of thirteen alkali crusts showed 39.06 per cent. of sodium chloride, 25.42 per cent. of sodium sulphate, and other salts in smaller quantities.

A soil survey in the Salt River Valley, Arizona, is reported by T. H. Means. This area embraces about 370 square miles and shows a variety of soils, nine types being described. Trouble from alkali is not experienced where the soils are well drained. Numerous analyses of alkali salts are reported and the reclamation of alkali lands is discussed. The predominant salt found was sodium chloride.

A soil survey around Fresno, California, is reported by T. H. Means and J. G. Holmes. This area covers about 625 square miles and includes foothills, plains and bottom lands. Ten types of soils are described, the Fresno sand covering 40 per cent. of the area and corresponding in texture and crop value to the truck soils of the Atlantic coast. About 84 per cent. of the area is free from injurious quantities of alkali. In twenty samples of alkali crusts the sodium carbonate ranged from 5.72 to 93.35 per cent. Methods of preventing the rise of alkali and of reclaiming alkali lands are discussed.

A soil survey around Santa Ana, California, is reported by J. G. Holmes. The district surveyed extends from the foothills to the Pacific Ocean and comprises about 300 square miles. It is for the most part a delta plain and shows nine types of soil. The alkali salts consist principally of sodium chloride and sodium sulphate, but are present in injurious quantities in only comparatively few areas.

Investigations on the physical properties of soils carried on during the year are briefly summarized by L. J. Briggs. A marked difference was found to exist in the capillary movement of water in dry and in moist soils. In one instance the capillary rise in moist soil was over 4.5 times that in the dry soil. Sodium carbonate in solution was found to facilitate the rise of water in dry soil. Pure quartz sand was found to absorb 200 times the amount of carbon dioxide that would ordinarily be contained in a

Digitized by Google

volume of air equivalent to that in the sand. A filter was devised for field use for obtaining clear soil solutions for chemical analysis.

F. K. Cameron, in a paper on the application of the theory of solution to the study of soils, discusses the rôle of iron, calcium, hydrous silicates, carbon dioxide, and organic matter in the soil; summarizes the results of investigations on the equilibrium between carbonates and bicarbonates in the soil, showing that sodium carbonate in solution when exposed to the air is converted into the comparatively harmless bicarbonate, the extent of the conversion depending upon the temperature and the concentration of the solution; gives briefly the results of studies on the solubility of gypsum and calcium carbonate in the presence of other salts; presents a classification of alkali soils; describes briefly methods of estimating carbonates, bicarbonates, and chlorides used in the field; and gives a brief account of some of the work reported in detail in the report noted below. The results of investigations in growing and curing tobacco are stated by M. L. Floyd. H. W. LAWSON.

Some Mutual Relations between Alkali Soils and Vegetation. BY THOMAS H. KEARNEY AND FRANK K. CAMERON. *U. S. Dept. Agr. Rep.*, No. 71. pp. 78.—This consists of three papers. The first reports an extensive series of laboratory experiments to determine the effects of various alkali salts upon seedling plants. The salts were dissolved in pure water and used singly and in combinations. Seeds of white lupine and alfalfa were germinated and suspended in the different solutions for twenty-four or forty-eight hours. When the salts were used alone the limits of endurance for white lupine in parts per 100,000 of water were as follows: magnesium sulphate, 7; magnesium chloride, 12; sodium carbonate, 26; sodium sulphate, 60; sodium chloride, 116; sodium bicarbonate, 167; and calcium chloride, 1,377. When used in combination with calcium sulphate and calcium carbonate the limits were as follows: magnesium sulphate, 2,240; sodium sulphate, 2,160; sodium chloride, 1,160; magnesium chloride, 960; sodium bicarbonate, 417; and sodium carbonate, 56. The presence of the calcium salts is shown by these results to have a remarkable influence in lessening the toxic effect of the other salts. In weak solutions some of the salts were stimulating. At certain strengths they were all neither toxic nor stimulating. The second paper deals with the formation of black alkali by plants, in which it is stated as a result of experiments that neutral salts are possibly, or even probably, transformed into corresponding carbonates through the agency of plant growth. In the third paper it is pointed out that certain plants are especially resistant to black alkali and an explanation for this is offered.

H. W. LAWSON.

Digitized by Google

On the Average Composition of Milk of Pure Bred Cows of Different Breeds. By F. W. Woll. *Wis. Agr. Expt. Sta. Rep.*, 1901, pp. 85–97.—Analyses by the author of ninety-seven composite samples of milk from eighty-two cows representing four breeds are averaged in the following table:

Average Composition of Milk of Pure Bred Cows.

	Number of cows.	Number of analyses.	Solids. Per cent.	Fat. Per cent.	Casein and albumen. Per cent.	Milk-sugar. Per cent.	Ash. Per cent.	Solids, not fat. Per cent.	Fat in solids. Per cent.
Holstein.....	70	75	11.78	3.33	3.18	4.52	0.75	8.45	28.3
Guernsey.....	2	12	14.46	5.39	3.45	4.83	0.79	9.07	37.3
Shorthorn....	2	2	12.60	3.52	3.53	4.63	0.92	9.08	27.9
Red Polled...	8	8	12.57	3.74	3.34	4.75	0.74	8.83	29.7

Compiled data are also given on the composition of the milk of the principal American dairy breeds. H. W. Lawson.

The Trowbridge Method of Calibrating Babcock Test Bottles. By E. H. Farrington. *Wis. Agr. Expt. Sta. Rep.*, 1901, pp. 129–131.—To apply this practical test the bottle is filled with water to the zero mark and a piece of metal, standardized to displace 2 cc. of liquid, is carefully lowered into the bottle to below the 10 per cent. mark to which the water should rise if the graduation is correct. H. W. Lawson.

Influence of Manure upon Sugar Beets. By W. H. Jordan and G. W. Churchill. *N. Y. (Geneva) Agr. Expt. Sta. Bull. No.* 205, pp. 251–264.—Six varieties of sugar beets were grown during four seasons with no manure, with commercial fertilizers, and with stable manure to compare the effect of the three methods of treatment upon the content of sugar and the coefficient of purity. Contrary to the statement often made, the free application of stable manure in the spring did not injure the quality of the beets. With the exception of one year the percentage of sugar was much higher in beets grown with the stable manure.
H. W. Lawson.

An Apparatus Facilitating the Analysis of Sugar Beets. By Roscoe H. Shaw. *Wis. Agr. Expt. Sta., Rep.*, 1901, pp. 281–284.—An apparatus designed to facilitate the determination of the specific gravity of the juice and the preparation of the same for the polariscope is figured and described.
H. W. Lawson.

Commercial Fertilizers for Onions. By W. H. Jordan and F. A. Sirrine. *N. Y. (Geneva) Agr. Expt. Sta. Bull. No.* 206, pp. 265–274.—A complete fertilizer analyzing 4 per cent. of

Digitized by Google

nitrogen, 8 per cent. of phosphoric acid, and 10 per cent. of potash, was applied in quantities ranging from 500 to 2,000 pounds per acre in experiments with onions covering four years. The results from an economic standpoint rather favored the use of 500 pounds per acre. H. W. LAWSON.

Report of Analyses of Paris Green and Other Insecticides in 1901. BY L. L. VAN SLYKE AND W. H. ANDREWS. *N. Y. (Geneva) Agr. Expt. Sta. Bull. No.* 204, pp. 245–249.—In forty samples of Paris green analyzed during 1901, the total arsenious oxide varied from 56.13 to 62.87 per cent., and averaged 58.10 per cent.; the water-soluble arsenious oxide varied from 0.88 to 2.64 per cent. and averaged 1.28 per cent.; the copper oxide varied from 26.53 to 31.14 per cent. and averaged 29.88 per cent.; and the arsenious oxide in combination with copper varied from 49.70 per cent. to 57.72 per cent. and averaged 55.98 per cent., indicating, in general, a good quality of Paris green in the market.
H. W. LAWSON.

Methods for the Analysis of Insecticides and Fungicides. BY J. K. HAYWOOD. *U. S. Dept. Agr., Bureau of Chem. Circ., No.* 10. pp. 8.—Methods, with references, are given for the analysis of Paris green, London purple, copper carbonate, potassium cyanide, soap, soda-lye, tobacco and tobacco extracts, and formalin. H. W. LAWSON.

Fertilizers. *Ky. Agr. Expt. Sta. Bull. No.* 97, pp. 225–261; *N. Y. (Geneva) Agr. Expt. Sta. Bull. No.* 201, pp. 103–168; *Wis. Agr. Expt. Sta. Rep.*, 1901, pp. 277–280.—The usual data obtained in fertilizer inspection. H. W. LAWSON.

Feeding Stuffs. *Conn. (Storrs) Agr. Expt. Sta. Rep.*, 1900, pp. 82–95; *Mass. (Hatch) Agr. Expt. Sta. Bull. No.* 78. pp. 40; *Vt. Agr. Expt. Sta. Bull. No.* 88. pp. 16; *Wis. Agr. Expt. Sta. Bull. No.* 90. pp. 8; *Rep.*, 1901, pp. 285–288; *Pa. Dept. Agr. Bull. No.* 87. pp. 41.—Analyses and other data relating to commercial feeding stuffs. H. W. LAWSON.

Ricinus Oilcake. BY DR. OSKAR NAGEL. *J. Soc. Chem. Ind.*, 21, 30–31.—Ricinus oil-cake, or castor pomace, contains a poisonous albuminoid, ricin or ricinin, and so is unfit for feeding purposes. Ricin is very similar in some of its chemical properties to fibrin. The ricinus oilcake may be freed from its poisonous constituent, so that it may be used for feeding purposes. The method of purification is as follows: The powdered oilcake is extracted with 10 per cent. salt solution, in which the ricin is soluble. The mass is filtered, the residue pressed and dried. The ricin may be separated from the filtrate, and the salt used recovered. Of physiological interest is the fact that while ricin has toxic effects upon man, it has no such effects in chickens.
F. P. UNDERHILL.

Digitized by Google

PATENTS.

OCTOBER 1, 1901.

683,429. Ernest D. Bell, London, England. **Papainized cheese paste.** Crushes cheese to a soft broken mass, mixes with an alkaline liquid containing about five grains of papain to each pound of cheese, and cooking the paste till the albumen is converted into peptone.

683,464. Bernhard Heyman, Elberfeld, Germany. Assignor to Farbenfabriken of Elberfeld Co., New York, N. Y. **Making acetic anhydride** by treating alkaline salts of acetic acid with a mixture of chlorine and sulphurous anhydride, and separating the resulting acetic anhydride from the reaction mixture.

683,490. Joseph F. Pflieger, Corning, Ohio. **Composition for tempering tool points.** Consists of ammonium carbonate, potassium carbonate, potassium nitrate, 6 ounces each; soap, 4 ounces; and water 15 gallons.

683,562. Edward W. Lancaster, Westminster, England. **Preparing calcium carbide** by saturating it with creosote, which may be diluted with kerosene, whereby decomposition of the carbide is prevented.

683,728. Robert Croasdale, Syracuse, N. Y. **Treating raw hide** by removing hair, flesh, etc., from the hide, then saturating it in a bath of soft water, 1000; salicylic acid, 2; picric acid, 3; and boric acid, 25 parts by weight; then drying the hide and applying a solution of bichromate of potassium in the dark, lastly exposing to light.

683,735. Sam. Dyson Elland and John Gaskell, London, England. Making **petroleum products** by mixing mineral oil with a fatty acid, heating the mixture to 110° to 150° F., adding an alkali solution and water and continuing the heat and agitation, then mixing 800 parts of this emulsion with 200 parts of oleic acid and 150 to 200 parts of caustic potash solution of 30° Baumé, and thoroughly mixing till the caustic liquor is absorbed.

683,785. Thomas Newsome, Roslindale, Mass. Assignor to American By-Products Co., N. J. Process of manufacturing **cellulose**, from cottonseed hulls. Removes wax, etc., by a hydrocarbon vapor, extracts the coloring-matter and dissolves the shells by caustic alkali under pressure, and washes and bleaches the remaining fiber.

683,786. To same parties for a **dye from cottonseed.**

683,787. To same parties for the **oil from cottonseed hulls.** The process is nearly the same as in 683,785, except that a current of hot air is used to remove the hydrocarbon, and sulphuric

Digitized by Google

acid to purify the oil. The dye is extracted by steam under pressure.

683,795. William S. Rawson, Westminster, and Robert D. Littlefield, Thornton Heath, England. Process of making **bricks, crucibles, etc.** Mixes calcined magnesite and a fusible compound of boron with a little water, molds and bakes.

OCTOBER 8, 1902.

683,899. Simeon Bishop, San Francisco, Cal. **Preserving foods,** by washing them with a solution of boracic acid, applying a coating of gelatin and finally wrapping in tissue paper impregnated with boracic acid.

683,929. William A. Gill, Tarrytown, N. Y. Assignor to Rendrock Powder Co., New York, N. Y. **Explosive compound:** Marble dust, 25; potassium chlorate, 58; nitrobenzene or other liquid nitro compound, 17 per cent.

683,980. Carl Pietzner, Vienna, Austria-Hungary. Process of preparing **sensitive films**, for photographing in relief, by adding silver nitrate to an acidulated solution of bichromated gelatin, heating the mixture a long time, adding absolute alcohol and cooling it quickly.

683,981. Achille M. Plaissetty, Paris, France. **Incandescent mantles,** from nitrocellulose dissolved in glacial acetic acid or acetone, to a syrupy consistency, adding a mixture of salts chiefly thorium nitrate, spinning the mixture in filaments, soaking them two to three hours in ammonium sulphide, washing in water and drying at 150° to 175° C.

684,032. Adolf Wunsche, Charlottenburg, Germany. Assignor to Siemens and Halske, Berlin, Germany. Making **objects from asbestos,** by molding them and then saturating with silicon fluoride.

684,065. Hugo Joesschin and Oscar Kaltwasser, Berlin, Germany. Assignors to Actien Gesellschaft für Anilin Fabrikation, same place. **Blue azo dye.** A dark powder, solution in water dark violet, changing to blue by sodium carbonate and a fine red by mineral acids, easily soluble in concentrated sulphuric acid to a red-violet turning red on adding ice-water, hardly soluble in alcohol blue-red, dyeing on wool, with copper salts a fine blue, and derived from diazotized 4-chloro-2-aminophenolsulphonic acid and 1,8-aminonaphthol-3,6-disulphonic acids.

684,091. Frank H. Platt, Brooklyn, N. Y. **Composition for pipe coatings, etc.,** consisting of equal volumes of calcined gypsum and wood fibre, with a small quantity of alum, whiting, and salt.

684,192. Charles Clamond, Paris, France. **Refractory mantle,** consisting of the oxides of zinc and thorium, and the oxides of cerium and iron.

Digitized by Google

684,208. Samuel Evans, Chicago, Ill. Assignor one-half to Charles L. Rawson, same place. **Preparing surfaces for engraving.** Coats one side of glass with a mixture of potassium bichromate, glue, glycerol and ammonia, prints a negative from the other side of the glass, washes off the coating from the parts not acted on by light, soaks in glycerol to make the coating resist a blast, applies the sand-blast and finally washes off the rest of the coating.

OCTOBER 15, 1901.

684,457. Heinrich Polikier, Berlin, Germany. Assignor to Actien Gesellschaft für Anilin Fabrikation, same place. **Violet acid dye.** Tetraalkyldiaminobenzophenone and methylphenyl-α-naphthylamine are condensed together and sulphonated, forming a red violet powder soluble in water or alcohol, the former precipitating with dilute hydrochloric acid which, in excess, dissolves the precipitate to a green or yellow-brown solution, concentrated sulphuric acid gives an orange-brown solution, turning first yellowish on dilution with ice-water, then green-blue, and finally clear blue, dyeing wool clear violet shades.

684,493. Woodbrige H. Birchmore, Brooklyn, N. Y. Assignor of one-half to Clarkson A. Collins, New York, N. Y. **Making incandescent mantles** by saturating a combustible fabric with a solution of magnesium oxide in zinc oxychloride, burning out the combustible fabric therefrom, then coating the mantle form with a solution of metallic earth oxides.

684,521 to 684,524 inclusive. William Painter, Baltimore, Md. Assignor to the Crown Cork and Seal Co., Baltimore, Md. **Compositions** of body material, vaselin, glue, glycerol, ester gum, resinous and fatty matter. Adapted for bottle stoppers, floor cloth, etc.

684,545. William A. Hall, Bellows Falls, Vt. **Casein glue,** of casein, sodium phosphate, sodium sulphite and lime.

684,546. Ferdinand C. von Heydebrand und der Lasa, New York, N. Y. **Artificial fuel,** smokeless and recombustible of earth, carbon, sulphur, lime, and a binder.

684,553. Adolph G. Rohde, Hoboken, N. J. Assignor one-half to August C. Hartman, same place. **Glove powder.** Tin oleate, magnesium carbonate and silicate.

684,578. Charles W. Merrill, Alameda, Cal. **Precipitant for recovering metals from cyanide solutions.** Zinc and a gritty non-metallic finely divided material such as silica, emery, corundum, to increase the exposed surface of the precipitant.

684,590. Frederic W. C. Schniewind, Everett, Mass. Assignor to United Coke and Gas Co., Charleston, West Va., and Philadelphia, Pa. **Method of enriching gas** by drawing off separately the rich and poor gases from a multiple series of coke ovens, condensing and washing the poor gases to eliminate tars and

Digitized by Google

other impurities, scrubbing them with oil to absorb the benzene and other illuminants, distilling off from the oil the benzene and other illuminants, which are mixed with the rich gases, and the whole mixture is condensed and washed to remove ammonia, etc.

684,649. Wilhelm Olschewsky, Berlin, Germany. **Raw mixtures for sand bricks.** Mixes lime, 6, with water enough to slake it, adds sand, 28, and heats in a closed vessel, then adds sand, 56, and enough water to make 10 per cent. of the mixture.

684,650. Leopold Spiegel, Berlin, Germany. **Yohimbine, an alkaloid** crystallizing in white needles from alcohol, nearly insoluble in water, melting at 234° C. corresponding nearly to $C_{22}H_{30}N_2O_4$, and got from a species of apocynaceæ by extracting the bark with dilute acetic acid, precipitating with sodium carbonate, and crystallizing from alcohol.

684,695. Richard Kuch, Hanau, Germany. **Process of connecting platinum with non-metallic bodies.** Makes a loose connection of the wire with a non-metallic non-smeltable oxide, as chalk or magnesia smears the end of the body with a solution of platinum salts, heats the same to a glow, and hardens and strengthens by alloying.

684,707. Ernst Murmann, Vienna, Austria-Hungary. **Alloy of aluminum,** 100; magnesium, 1–10; zinc, 10–20 parts.

684,710. Martin C. Olson, Chicago, Ill. **Ink-erasing composition.** Powdered pumice, 2; boiled glue, 2; white of egg, 1; and boiled sugar, 1 parts by volume.

684,739. Joseph H. Amiss, Philadelphia, Pa. Assignor one-half to Charles Fremont Taylor, same place. **Artificial pavement,** made by granulating asphalt in cold water, mixing it with sand in the water, adding oil as a fuel to the composition, firing the same to produce heat sufficient to unite the whole mass into concrete, and while still plastic adding calcium carbonate.

OCTOBER 22, 1901.

684,831. Arthur Lehmann, Berlin, Germany. Process of **preparing secondary battery plates,** by subjecting them to an electric current while in a bath containing a fatty acid, neutralizing said bath to cause the acid to act in a nascent state, removing the plates and treating them with caustic soda, washing, drying, and exposing them to sulphuric acid.

684,840. Pierre Mercier and Marc Chaumartin, Lyons, France. Process of **dyeing,** by treating the warp or woof with tannin and bichloride of tin, serving as mordant for basic dyes and as reserve for acid dyes, weaving the prepared and unprepared components, and passing the fabric through several baths of successive dyes, the acid dye fixing on the unprepared material and the basic dyes on the prepared material.

Digitized by Google

684,863. William H. Porter, New York, N. Y. A **catalytic substance** for igniting gas by its own action consisting of platinum black and chromium oxide.

684,864. Fritz Projahn, Duisberg, Germany. Process of making **alkalies and aluminates,** by heating the respective sulphates with metals whose compounds with sulphur are soluble in water, and producing aluminates by adding aluminum oxide to the mixture.

684,914. George Craig, Glasgow, Scotland. Purifying **alkaline cyanides.** Separates by double decomposition alkaline sulphides and carbonates from ammoniacal solutions of alkaline cyanides by lead chloride or other salt insoluble in the menstruum and the foul charge is washed with liquid ammonia till free from cyanide, and the ammonia is then recovered and the purifier recharged.

684,985. Thomas A. Haynes, Hoboken, N. J. **Artificial glue.** A mixture of casein, 3, and resin soap, 2 parts by weight.

685,038. Pearis B. Ellis and Albert Y. Werner, Carson City, Nev. **Substitute for rubber.** The bruised stalks of chrysothamnus or bigelovia are bruised and extracted with a hydrocarbon solvent, which is then distilled off, and the residual gum washed and worked. May use carbon disulphide.

685,059, 685,060 and 685,061 are to George H. Richards, London, England, for **nicotine salicylate**, and compounds thereof with camphor as an insecticide, also for nicotine tartrate, both salts are made by direct combination with the aid of heat, crystallizing and drying.

685,094. Sven E. Boivie, Ragnhildsborg, Sweden. **Artificial stone,** made by mixing lime and a silicious material with nitric acid, molding the mixture and treating it with steam under pressure.

685,128. Lucien Genty, Marseilles, France. Assignor to Lucien Genty and Le Société Generales des Industries Economique, Moteur Charon, Paris France. Process of **making gas** from bituminous coal in gazogenes by taking a portion of the producer gas between the reduction and distillation zones, passing it upward around the body of coals to heat the same, causing the remaining body of gas to flow through the distillation zone and withdrawing it at the top of the gazogene, and returning it together with all the tar and condensible substances into the gazogene between the zone of combustion and the zone of reduction for the purpose of decomposing the tar into hydrocarbons and carbon and thus providing an addition of combustible substance, and improving the final product.

685,198. . Henry S. Blackmore, Mt. Vernon, N. Y. Process of **reducing metal,** which consists in exposing a metalling oxide

Digitized by Google

and an alkali metal in a molten state to a metallic carbide capable of reducing said compound. May use sodium aluminate and calcium carbide.

OCTOBER 29, 1901.

685,435. Frederick M. Ruschaupt, Milwaukee, Wis. Process of **desulphurizing raw brine,** by conveying it a long distance in a shallow trough through whose side walls hydrogen sulphide may readily escape, and adding aluminum sulphate and soda.

685,460. Carl Reisser, Stuttgart, Germany. **Preparing plastic compounds,** by mixing alabaster, 2 parts, and whiting, 1 part, with French hare skin glue, stirring till a thin liquid is formed, then adding vegetable fiber to a pasty mass.

685,461. Claude A. O. Rosell, New York, N. Y. Making **printing surfaces.** Assignor to the American Lithographic Company Corporation of New York. This and 685,462 are for depositing zinc on an aluminum surface by a current of one-quarter to one-half an ampere per square foot of cathode surface, from a non-alkaline solution of an ammonium salt, a basic zinc salt, and an aluminum salt, and maintaining the bath in a basic and non-alkaline condition throughout the operation, thereby producing an adherent granular zinc coating.

685,472. Eugene Hermite and Charles F. Cooper, Paris, France. Process of manufacturing **copper sulphide rods for thermoelectric couples,** by fusing copper sulphide with a little iron sulphide, casting it in molds, placing in a crucible, heating and treating with sulphur vapor, removing and cooling it, replacing it in the crucible with copper and heating.

685,508. Clinton E. Dolbear, Hyde Park, Mass. Assignor to American Mining and Metal Extraction Co., Portland Me. and Boston, Mass. Method of **separating valuable metals,** from mill pulp, etc., which consists in passing the metalliferous material between electrodes of opposite polarity whereby all the particles of the metalliferous material are attracted towards the electrodes, and after contact therewith the metal particles are repelled from the electrode with which they have made contact, and attracted to the opposite one, while the silicious material remains under the attracting influence of the first electrode, and the metal is arrested in its travel, and separated.

685,538. Emil A. Starz, Helena, Montana. **Urine tester,** for determining specific gravity, albumin, etc. Consists of a base, an upright connected therewith, a slide movable on the upright with means for fastening it, two communicating tubes supported by said slide above the base, one of said tubes having a downward extension with a light colored background and a dark background adjacent thereto, and a cock controlling the communication of said tubes.

Digitized by Google

685,543. Wilhelm Weber, Stollberg II, Germany. Assignor to Chemische Fabrik Rhenania, Aachen, Germany. Process of obtaining a **preparation of pancreas,** capable of resisting the gastric juice, by stirring fresh or finely comminuted pancreas into a solution of tannin.

685,585. Samson Duffner, Berlin, Germany. **Producing sugar** by boiling a first sugar with surcharged beet syrup, separating the resulting first sugar and first molasses, washing said first sugar with raw beet syrup whereby a surcharged beet syrup is obtained, adding to said first molasses, calcium carbonate, and barium chloride, filtering the mixture, boiling the same, and separating the resulting second sugar and second molasses.

685,691. Robert McKnight, New York. Assignor to Metallic Condense Co., of Delaware. **Extracting gold from refractory ores.** The ore is pulverized and mixed with salt in proportions adapted to produce in the presence of oxygen a chloride of the metal and an oxygen salt of the alkaline metal and metalloid, roasting the mixture with air but excluding the products of combustion, and continuing the heating till a chloride of the precious metal is volatilized and carried off and collected.

685,719. Charles P. Harris, Rutland, Vt. **Fuel saving compound.** Water, 96 gallons; coal dust, coke ashes, wood ashes and tan-bark ashes each ten pounds; soap, 7; salt, 24; and marble dust, 10 pounds.

685,729 and 685,730. Walter Nernst, Gottingen, Germany. **Glower for electric lamps.** Assignor to George Westinghouse, Pittsburg, Pa. Zirconium oxide, 80; gadolinite and its associated earths, 20, part of those belonging to the cerium group being removed.

NOVEMBER 5, 1901.

685,842. Charles J. Johnson, St. Louis, Mo. Process of **hardening metals,** which consists in forming them at a high temperature, cooling them by an air-blast to a cherry-red, then submerging the articles in a bath made of sal soda, rosin, animal oil, and water.

685,891. Richard B. Wheatley, London, England. **Alloy,** made of several alloys. No. 1: copper, 80; manganese, 20. No. 2: nickel, 50; tin, 10; copper, 40. No. 3: copper, 80; aluminum, 20. No. 4: tungsten and iron equal parts. Mix 66 parts copper and 50 parts zinc, add 5 parts of No. 1, 2 of No. 2, 5 of No. 3, and 4 of No. 4.

685,895. Ernest Wirth, Dortmund, Germany. **Purifying anthracene,** by suspending it in an indifferent solvent which dissolves anthracene slightly, but nitroso-carbazole easily, then adding nitrous acid and separating the nitroso-carbazole from the undissolved anthracene, adding acid to the solution to split off

Digitized by Google

nitric oxide which is converted into nitrous acid for repeated use.

685,907. Theodore F. Colin, Elizabeth, N. J. Process of **desulphurizing Ohio petroleums,** which consists in mixing with the distillate for simultaneous action, sulphuric acid and copper oxide, separating the sludge, precipitating the metal and washing out the free sulphonic acids, and finishing with alkali and water.

686,021. Henry S. Blackmore, Mt. Vernon, N. Y. Making **sulphur trioxide.** Heats sulphur dioxide, introduces free sulphur into it, and brings it into contact with iron oxide.

686,022. Henry S. Blackmore, Mt. Vernon, N. Y. Making **sulphuric anhydride.** Exposes a metallic oxide to the action of sulphur dioxide at a temperature below the dissociating point of sulphur trioxide, which is made and conveyed to a condenser, raising the temperature of the metallic residue and passing oxygen over the same, cooling it and reusing.

686,049. Ulrich Ganz, Nordhausen, Germany. Assignor to Albert Kahn and Martin Heberlein, Eisenach, Germany. **Artificial fuel,** of ground gypsum, 80 per cent., and peat, 20 per cent.

686,059. William D. Hartshorne, Methuen, Mass., and Emile Maertens, Providence, R. I. Assignors to International Solvent Co., Saco, Me. **Treats suint** in a volatile solvent before distillation with salt and sulphuric acid, decants the solvent carrying the fatty matter, and distils off the solvent which may be a hydrocarbon, as described in patent 630,296.

686,170. Charles N. Waite, Cranford, N. J. **Purifying lactic acid,** by mixing the crude solution with amyl alcohol, allowing the mixture to separate by gravity, decanting the higher strata of the fluid containing lactic acid and alcohol, distilling off the latter with steam, and washing the alcoholic solution.

NOVEMBER 12, 1901.

686,282. Edward Gold, Vancouver, Canada. **Protecting piles from Teredo navalis,** by coating a suitable fabric with the following composition, applying the hot fabric to the pile or timber, and then an exterior coating of comminuted rock. Composition is sand, 60; cement, 21; slaked lime, 2; crushed brimstone, 3; and powdered asbestos, 3 parts by weight.

686,333. Paul J. Prior, Cologne, Germany. Assignor to Heinrich Hunnakies Straelen, Rhineland, Prussia. **Artificial stone,** made from a mixture of lime and silicious sand material impregnated with alkaline salts suspended in steam.

686,356. Sigismond E. Simon, Belleville, N. J. Brown **anthracene dye,** from dinitrooxyanthraquinone treated with reducing agents as iron or tin which reduces the nitro groups without affecting the carbonyl, producing diaminooxyanthraquinone, then

Digitized by Google

by nitrous acid obtaining di-diazooxyanthraquinone and finally by boiling in water obtaining the trioxyanthraquinone which is readily soluble in both ammonia and caustic alkali, the solutions having a brown color with a cherry-red tinge.

686,374. Julius Wezel, Leipsic, Germany. **Size for paper.** Dissolves potato starch in an alkaline solution of ceratin (horn shavings in soda-lye), and water-glass, and adds acetic acid till the solution is weakly alkaline only.

686,411. Robert Mackill, Glasgow, Scotland. **Sheep dip.** Cresylic acid or cresol, 7; nicotine, 5; cottonseed oil soap, 8; sodium carbonate, 4; sulphur, 68; and kieselguhr, 16 parts by weight.

686,582. Henry R. Brinkerhoff, Oak Park, Ill. **Waterproofing wood,** by saturating it with a hot volatile oil holding lanolin in solution.

686,654. John A. Henderson, Lawrence, Kansas. **Nail coating,** of rosin ten parts by weight to one each of gum arabic and linseed oil, heated together.

686,661. Reynold J. Kirkland, Grand Rapids, Mich. **Copying composition.** A base of chondrin and a viscous body as glycerite of starch, the chondrin precipitated on the paper by lead acetate.

686,663. Thomas McAlpine, Chiswick, England. Assignor to Alcohol Syndicate, Limited, London, England. **Manganese compound.** Treating a solution or emulsion of alkalies or alkaline earths to **acetylene** gas, adding a solution containing manganese, and continuing the action of the acetylene, then separating the compound of manganese and acetylene. To be used in purifying mineral oils.

686,665. Shehadi A. Shehadi and Adeeb Faris, Providence, R. I. **Detergent.** Water, 1 gallon; ammonia extract of laurel and rose water, 1 ounce each; potash, 10 ounces; potassium carbonate, 2 ounces; and extract of peppermint, ⅛ ounce.

685,672. Richard J. Friswell, London, England. Assignor to British Uralite Co., Limited, London, England. Manufacture of **refractory materials.** Dips, blocks or sheets of asbestos, chalk or similar materials in a silicate, then in a solution of bicarbonate, continuously regenerating the bicarbonate solution by carbon dioxide, removing and heating the bicarbonate thrown out of the saturated solution, whereby carbon dioxide is recovered, and melting the residue with sand to form sodium silicate and recover more carbon dioxide, all of which materials are reused.

686,679. Leonard Paget, New York, N. Y. Assignor of one-half to Charles Coster, same place. **Storage battery electrodes,** from lead oxide and lead and zinc sulphates, mixed, moistened and pressed together, and dissolving out the zinc sulphate by an

Digitized by Google

electric current through a sulphate solution to a plate forming the cathode.

686,688. William F. Eger, Fort Wayne, Ind. **Chemical compound for purifying water,** consisting of soda-ash, 200; sal soda, 200; glucose, 20 pounds, and lime-water sufficient to make 52 gallons.

NOVEMBER 19, 1901.

686,695. George Alefeld, Darmstadt, Germany, Assignor to Ludwig Ziegenbruch, same place. **Colors for lustre-ware.** Adds boracic acid compounds to solutions of metallic resinates in ethereal oils. These pigments are for glass or enamel ware.

686,744. Michael M. Lipps, Bluff City, Tenn. Making **fertilizer.** Makes a layer of fine barnyard manure, and sprinkles the layer successively with ammonium sulphate, sodium chloride, acid phosphate and lime, covers this with earth over which is spread sodium nitrate, potassium chloride and lime, allowing to stand for a while and mixing and pulverizing it.

686,772. Cyrus J. Seltzer, Philadelphia, Pa. Assignor to the National Recovery Company of Delaware. **Recovering alcohol from empty barrels.** Steams the barrels from the outside only, and draws off and condenses the vapor from the inside of the barrel. Applied to barrels that have contained alcohol or alcoholic liquors.

686,855. William T. Kendrick, Montgomery, Ala. Making a **disinfectant.** Treats chloride of lime with water, allows to settle and decants, adds a hot solution of potassium carbonate, precipitates and decants, then adds boracic acid and potassium permanganate.

686,915. Henri M. Taquet, Argenteuil, France. Treating **zinc ores.** Adds the oxide of an alkaline earth metal to a solution of zinc sulphate and chloride whereby zinc oxide and a sulphate of the alkaline earth metal are precipitated, heating this precipitate with carbon, thereby obtaining metallic zinc and a residue of alkaline earth metal sulphide.

686,947. William Marsh, Manchester, England. Making **magnesium carbonate.** Burns magnesia to make an oxide, adds water and powdered charcoal, and subjects the mixture to carbonic acid under pressure.

686,949. Johannes Pfleger, Frankfort-on-Main, Germany. Assignor to the firm of Deutsche Gold und Silber-Scheide Anstalt vorm. Roessler, same place. Making **cyanides** by reacting alkali metal with fluid or gaseous carbon compounds and ammonia at 350° C. to 600° C., whereby alkali cyanamide is formed, and reacting on this with more carbon at a higher temperature to make a cyanide.

Digitized by Google

686,950. Same as above, omitting the last step and obtaining **cyanamide.**

686,978. Karl Kiefer, Cincinnati, Ohio. Process of **crystallization.** Rinses a bottle with a heavy saccharine solution, introduces some starting crystals and fixes them to the sides of the bottle by drying, and fills the bottle with an alcoholic and supersaturated saccharine solution.

686,998. Alfred Ammelburg, Hochst-on-Main, Germany. Assignor to Farbwerk vorm. Meister Lucius and Bruning, same place. Neutral compound of **dimethylaminodimethylphenyl pyrazolone** with camphoric acid by concentrating a mixed anhydrous solution of these substances in the dark at ordinary temperatures.

686,999. Same as above, but an acid compound by varying the proportion.

687,029. William B. Hughes, Philadelphia, Pa. **Making steel.** Provides an open-hearth with a bath of molten iron, heats iron oxide outside the furnace just to the melting-point and mixes it with lime to make a highly oxidizing liquid basic slag to mix with the molten iron on the hearth, eliminating thereby phosphorus and silicon, while the iron is high in carbon, and at a relatively low temperature, removing the slag to permit the rapid heating of the metal, and raising its temperature to the tapping-point after reducing the carbon to the required percentage.

687,072. Max Schumann, Ludwigshafen, Germany. Assignor to the Badische Anilin und Soda Fabrik, same place. **Brown dye.** Heats dinitroacetanilide with sulphur and alkaline sulphides. It dyes cotton brown shades, turning slightly yellow with chromates.

687,079. Thomas M. Thom, Wood Green, England. **Artificial stone.** Calcines limestone in a kiln supplied with carbon monoxide and hydrogen, slakes and molds the lime thus obtained into slabs or blocks, and treats these with the pure carbon dioxide of the first operation to produce an artificial lithographic stone.

687,080. **Same** as above, but the process carried out under pressure increasing from 30 to 350 pounds per square inch, and at a temperature of about 90° F.

687,085. Ernst Trainer, Bochum, Germany. Making **briquettes for fuel.** Evaporates waste lyes of cellulose factories till dry, pulverizes and mixes with tar and coal, then molds into blocks and heats until the materials unite.

687,171. Moritz Ulrich and Karl Heidenreich, Elberfeld, Germany. Assignors to Farbenfabriken of Elberfeld Co., New York, N. Y. **Disazo dye.** Tetrazotizes the disulphonic acid of *p-p*-diaminodiphenyl urea and combines the resulting compound

Digitized by Google

with two molecules of β-amino-α-naphtholsulphonic acid. Red or brown powders soluble in water, dyeing unmordanted cotton red to red-violet shades.

687,258. William Orr, Salt Lake City, Utah, Assignor to the Gold and Silver Extraction Co., Denver, Col. **Recovering cyanides,** by adding a zinc salt to throw down zinc cyanide, separating the granular precipitate and treating it with an alkaline hydroxide and an alkaline sulphide, then removing the zinc sulphide from the cyanide solution.

687,350. Alexander E. Tucker, Birmingham, England. **Artificial fuel.** Made of dari, 1.25, and crushed coal, 98.75 per cent. Dari is a Hindoo seed boiled to a jelly.

687,490. Johan H. Vierdag, Willem J. H. Verheggen, Robert H. Arntzenius, and Antoon F. J. Byvoet, Breda, Netherlands. **Preserving eggs,** etc., by formalin, 1 part, benzoic acid, 1 part, and 1 to 10 parts alcohol in water.

687,531. Charles W. Jefferson, Schenectady, N. Y. **Insulating material.** Made of layers of oxidized linseed oil with mica scales united to form a solid pliable mass.

687,532. **Same** as above. Process of making the material.

687,567. Jaques L. Kessler, Clermont-Ferrand, France. **Hardening plaster** and fixing colors thereon, by the action of silicate solutions surcharged with alkali.

687,581. Heinrich Seidel, Vienna, Austria-Hungary. Assignor to Kalle & Co., Biebrich am Rhein, Germany. **Brown sulphur dye,** from waste sulphite cellulose lye, evaporated with alkaline sulphides and sulphur, a black powder easily soluble in water or concentrated sulphuric acid.

687,586. William S. Rawson, Westminster, and Robert D. Littlefield, Thornton Heath, England. **Refractory impervious articles,** of magnesium oxide and calcium borate.

687,657. Robert E. Schmidt, Elberfeld, and Adolf Sertorius, Flittard, Germany. Assignors to Farbenfabriken of Elberfeld Co., New York, N. Y. **Green anthraquinone dye.** Made by sulphonating symmetrical 1-5-dimethylamino-4-8-dialphyldiamino-anthraquinones and separating the dye, which is a dark green powder soluble in water and unchanged by alkalies, but changed by oxidizing agents to 1-4-5-8-tetraoxyanthraquinone.

657,658. To same parties as above, but **blue dye.** Sulphonates 1-methyl-amino-4-alphylaminoanthraquinone, its alkaline salts are dark blue powders soluble in water and giving quinizarine on treatment with an oxidizing agent in hot acidulated watery solution.

687,685. Harold D. Heather, Auckland, New Zealand. **Waterproofing fabrics.** Uses zinc white two, beeswax, one, and turpentine, three, parts by weight, mixed at 212° F.

Digitized by Google

DECEMBER 3, 1901.

687,834. Carl J. E. De Haen, List, Germany. Making **sulphuric anhydride.** Conducts a mixture of sulphurous acid and air over heated asbestos with vanadic acid in a fine state of division.

687,844. Alexander Mitscherlich, Freiburg, Germany. Manufacture of **paper sizing,** from spent sulphite liquor to which alkalies or alkaline carbonates are added, the precipitate removed and resinous and animal matters added to form the sizing.

687,909. Charles Wacker, Baltimore, Md. **Cooking and extracting oil from fish,** by passing them through a heated liquid, injecting steam into the mass and compressing them in the liquid, which may be hot water.

687,994. Eugen De Haen, List, Germany. **Purifying hydrochloric acid.** Runs crude hydrochloric acid into boiling sulphuric acid 10° C. hotter than the boiling-point of the hydrochloric acid, and condenses the vapors.

688,020. Rudolpf Knietsch, Ludwigshafen, Germany. Assignor to the Badische Anilin und Soda Fabrik same place. This **apparatus** is like a gigantic Liebig condenser in which the inner tube is filled with contact material through which sulphur dioxide and air are led, and the temperature maintained at a definite point by the surrounding flow of cooling liquid.

688,030. Friedrich Pich, Friedrichshagen, Germany. **Flux for brazing.** Mixes sodium carbonate and boric acid in molecular proportions, may add some sodium chloride.

688,056. Wilhelm Boehm, Berlin, Germany. Assignor to George A. Weiss, New York, N. Y. **Self-acting gas igniter.** An igniter from ethiops of metals of the platinum group, a perforated casing round said igniter and in two parts, the upper broader and shorter adapted for a handle and to center the igniter on the chimney.

688,073. Allan W. Dow, Washington, D. C. **Asphaltic cement,** made by distilling oils with asphalt bases for a long time at a high temperature till the hard brittle product is insoluble in petroleum naphtha, and then mixing with it a suitable flux as maltha.

688,102. Walter P. Lincoln and Morris S. Greenbaum, Louisville, Ky. **Treating residues of liquors, sugars, starch and glucose,** by adding salt and passing a current of electricity, then separating the solids and drying them.

688,120. Henry C. Rew, Chicago, Ill. Making **water gas,** by an air blast on coke in a coking chamber, simultaneously coking a body of bituminous coal, passing the products of combustion through the coking chamber into a superheater, heating the superheater by admitting air to complete the combustion,

Digitized by Google

passing steam through the incandescent coke, and mixing the water gas with the other gases and fixing them in the superheater.

688,131. Ferdinand Sembritzki, Holzminden, Germany. Assignors to Haarmann and Reimer, Holzminden, Germany. **Ianthone and ionone.** Mixtures of these substances are treated with hydrazine, which separates the ionone only, and from which condensation product the ionone is separated by acids.

688,162. Joseph W., Robert W., and Charles H. L. Comley, Braddock, Pa. Assignors to Patrick Thomas Cook, of Braddock, Pa., one-twentieth. **Welding metals,** by fusing the metal having the lowest fusing-point, heating the other metal to the same temperature and immersing it in the melted metal which is freed from sulphurous acid gas, solidifying it and covering it with a heat retaining medium.

688,294. Henry Carmichael, Malden, Mass. **Tanning hides,** by treating them first with chromic acid or a compound of chromic acid, then with a solution of a chromic salt as chromic chloride, while the latter solution is part by part exposed to the action of metallic zinc made electropositive in the presence of an acid.

688,350. Mark Sherwin and Hans M. Matheson, Cambridge, Mass. **Substitute for india rubber,** made by treating fatty oils with sulphur or sulphur chloride, adding coloring-matter, then diluted sulphur chloride.

688,449. Carrington C. Tutwiler, Philadelphia, Pa. Assignor to United Gas Improvement Co., same place. **Apparatus for gas analysis.** Consists of a tar arrester, a graduated burette into the top of which a graduated stoppered vessel drops its contents, connecting pipes with valves, a mercury levelling bulb, and pipes and valves between the bulb and burette, and the bulb and the air.

688,463. Hans Frasch, Hamilton, Canada. Making **caustic alkali,** by reacting on sodium chloride with nickel hydroxide in the presence of an excess of ammonia, producing caustic soda.

688,469, -470, -471 and -472 are all to Rudolph Knietsch, Ludwigshafen, Germany. Assignor to the Badische Anilin und Soda Fabrik, same place. Apparatus for making **sulphuric anhydride.** In general this apparatus is similar to a Liebig condenser on a large scale with the interior tube filled with contact material through which sulphur dioxide is passed, supply tanks and receivers, and various arrangements of the cooling pipes whereby the surplus heat is removed.

W. H. SEAMAN.

Digitized by Google

REVIEW OF AMERICAN CHEMICAL RESEARCH.

VOL. VIII. No. 6.

WILLIAM A. NOYES, Editor.

REVIEWERS:

M. T. Bogert, E. M. Chamot, B. S. Cushman,
Benton Dales, L. M. Dennis, A. H. Gill,
H. M. Goodwin, W. F. Hillebrand, L. P. Kinnicutt,
H. W. Lawson, H. N. McCoy, A. A. Noyes,
J. W. Richards, S. P. Sadtler, J. O. Schlotterbeck,
W. H. Seaman, F. P. Underhill.

GENERAL AND PHYSICAL CHEMISTRY.

On the Periodic System and the Properties of Inorganic Compounds. III. The Solubility of Alums as a Function of Two Variables. BY JAMES LOCKE. *Am. Chem. J.*, **26**, 332–345.—Through a graphical consideration of the solubility data previously communicated (compare *this Rev.*, **7**, 145) relating to the sixteen alums containing caesium, rubidium, thallium, or ammonium as univalent metal, and aluminum, vanadium, chromium, or iron as trivalent metal, the author shows that the ratio of solubility-differences, $\frac{S(M_1^{III}M_1^{I})-S(M_1^{III}M_2^{I})}{S(M_2^{III}M_1^{I})-S(M_2^{III}M_2^{I})}$, is a constant, whatever be the nature of the two univalent metals M_1^{I} and M_2^{I} in the alums, so long as the two trivalent metals M_1^{III} and M_2^{III} remain the same. These ratios are therefore functions only of the nature of the trivalent metals; and the author derives, through geometrical considerations, a complicated expression for the solubility of the sixteen alums, which expression includes only functions of these ratios and of certain other quantities which are determined only by the nature of the univalent metals.

A. A. NOYES.

Note on the Dissociating Power of Hydrogen Sulphide. BY WM. T. SKILLING. *Am. Chem. J.*, **26**, 383–384.—A solution of potassium chloride in hydrogen sulphide liquefied in a Pictet apparatus did not allow the passage of an appreciable current even when a potential-difference of 40 volts was applied.

A. A. NOYES.

The Dissociation of Certain Acids, Bases, and Salts at Different Temperatures. BY HARRY C. JONES AND JAMES M.

Digitized by Google

DOUGLAS. *Am. Chem. J.*, **26**, 428–453.—In this article are presented the results of determinations of the molar conductivity, at concentrations varying from molar or $^1/_2$ molar to $^1/_{2048}$ molar, and at temperatures of 0°, 7–18°, 25°, and 35°, of hydrochloric, nitric, and sulphuric acids; of potassium and sodium hydroxides; of potassium chloride, bromide, and iodide; of potassium, sodium, and ammonium nitrates; and of potassium sulphate and permanganate. The results show that the dissociation at a definite concentration does not in any case vary appreciably with the temperature between 0° and 35°. A. A. NOYES.

A New Apparatus for Determining the Relative Velocity of Ions; with some Results for Silver Ions. BY WILLIAM T. MATHER. *Am. Chem. J.*, **26**, 473–491.—The apparatus consists of two vertical limbs 2 cm. in diameter and 18 cm. long with a narrower graduated extension above; they are connected just below the graduated parts by a vertical U-tube 0.5 cm. in diameter, having at its center a stop-cock of large bore. The lower ends of the limbs are closed by perforated glass stoppers through which pass the wires connected with the silver-plate electrodes placed just above. At the close of the electrolysis the level of the liquid in the two graduated limbs was adjusted with reference to a previous calibration, the stop-cock in the U-tube closed, and the contents of the two parts of the apparatus washed out and analyzed, the results being controlled by a comparison with the total content of the measured quantity of solution introduced at the start. The apparatus has, however, the serious defect that it does not admit of the examination of a middle portion, which affords protection against error arising from convection or too-long-continued electrolysis.

The mean transference-numbers for the anion obtained by the author with a 0.1 molar solution of silver nitrate in water are 0.5411 at 0°, 0.5317 at 29.1°, and 0.5280 at 47.7°. Loeb and Nernst found 0.528 at 20°, and Hittorf 0.526 at 19°. With a 0.025 molar solution, the author found 0.5377 at 0° and 0.5246 at 45°, while Loeb and Nernst found 0.5383 at 0° and 0.5223 at 26°, Hittorf, 0.526, and Jahn and Berliner, 0.528 at 19°. With a 0.025 molar aqueous silver acetate solution the author found 0.373 at 0°, 0.382 at 28.3°, and 0.389 at 46.5°, while Loeb and Nernst found for a somewhat more dilute solution 0.376 at 24.5°, and Bein obtained the widely divergent value 0.413 at 24°.

A 0.1 molar solution of silver nitrate in 50 per cent. alcohol gave a result identical with that obtained in water solution; but in absolute alcohol the transference-number is much larger, 0.594 instead of 0.534. A. A. NOYES.

The Molecular Weights of Certain Salts in Acetone. BY HARRY C. JONES. *Am. Chem. J.*, **27**, 16–22.—The author has

Digitized by Google

determined the boiling-point-raising caused by cadmium iodide, ammonium sulphocyanate, mercury chloride, and sodium iodide in acetone, in order to investigate the discrepancy, cited by Kahlenberg and Lincoln (*this Rev.*, 5, 47), between the Ionic Theory and the statements that these salt solutions are good conductors of electricity, and yet exhibit normal boiling-point-raisings. The author finds, however, that the first two salts have apparent molecular weights that increase with the concentration from 1.2 to 1.4 times the normal value, thus showing that association takes place, which no doubt more than compensates for the effect of the existing ionization. Mercuric chloride gives a perfectly normal molecular weight value; but the conductivity of its acetone solution has been shown to be exceedingly small. Sodium iodide yielded a molecular weight value 5-10 per cent. below the normal. Since, according to Carrara, its conductivity is high, the author considers it probable that the effect of association is also in this case superposed on that of ionization. The normal molecular-raising for acetone was found by experiments with naphthalene to be 17.25°. A. A. NOYES.

The Lowering of the Freezing-point of Aqueous Hydrogen Dioxide. BY HARRY C. JONES, JAMES BARNES AND EDWARD P. HYDE. *Am. Chem. J.*, 27, 22–31.—It is found that potassium chloride, potassium nitrate, and sodium nitrate lower the freezing-point of an approximately 5 per cent. hydrogen peroxide solution by about 12, 20, and 2 per cent. less, respectively, than they lower that of pure water. A. A. NOYES.

Solubility of Mixtures of Sodium Sulphate and Sodium Chloride. BY ATHERTON SEIDELL. *Am. Chem. J.*, 27, 52–62.—The solubilities of sodium sulphate and chloride in solutions of each other of varying concentrations were determined at 10°, 21.5°, 25°, 27°, 30°, 33° and 35°. The results are plotted with the concentrations of the two salts as abscissas and ordinates. The curve at 10° has two intersecting branches, corresponding to sodium chloride and hydrated sodium sulphate, respectively, as the solid phase. Those at 21.5°, 25°, 27°, and 30° have three branches, anhydrous sodium sulphate appearing as a new solid phase. Those at 33° and 35° again have only two branches, the hydrated sodium sulphate not existing at these temperatures. An experiment is also described, proving that an inversion of the hydrated to anhydrous sulphate takes place far below 33° in the presence of the chloride, the author being evidently unacquainted with the work of van't Hoff and van Deventer (*Ztschr. phys. Chem.*, 1, 182, 1887.). A. A. NOYES.

Note on the Rate of Hydration of Metaphosphoric Acid. BY J. C. AND F. C. BLAKE. *Am. Chem. J.*, 27, 68–74.—The

Digitized by Google

authors have attempted to apply the refraction method of Duane (*this Rev.*, 7, 161) to a measurement of the rate of hydration of metaphosphoric acid, but have thus far obtained no reliable results. A. A. NOYES.

Electro-Affinity as a Basis for the Systematization of Inorganic Compounds. BY JAMES LOCKE. *Am. Chem. J.*, 27, 105–117.—In 1899 Abegg and Bodländer (*Ztschr. anorg. Chem.*, 20, 453) suggested a theory, the essential features of which are as follows: that each atom or radical has a definite affinity, designated electro-affinity, for the electric charge which it possesses when in the form of an ion; that the decomposition-voltages for the separate ions can be regarded as a measure of their electro-affinities, the assumption being involved that all single-ion-producing substances (the metals or halogens) have an approximately equal solubility with respect to the production of the ion; that the solubility of a substance is greater, the greater the electro-affinity of its two ions, but a very great affinity of one ion alone suffices to produce great solubility and to obscure this principle; that complex ions, that is, those formed by the union of a neutral molecule with a simple ion, are more stable the smaller the electro-affinities of the ions of the neutral compound and of the simple ion; and that the electro-affinity of the complex ion is greater than that of the simple ion.

The author claims that this theory is seriously inconsistent with the facts of inorganic chemistry. He points out that thallium, whose electro-affinity is small and which forms salts of slight solubility, as the theory requires, has almost no tendency to form either complex cathions or anions; and that, though barium (in spite of its greater electro-affinity), forms much less soluble salts than zinc, yet it has only a very slight tendency to form complex ions, while zinc has a considerable tendency to do so. It is also shown that the nitrates of eight bivalent metals whose decomposition-voltages are widely different, have solubilities of the same order of magnitude, and that the same is true of the double sulphates of many of them with ammonium sulphate; also that the tendency of copper, nickel, cadmium, and zinc to form complex ions with ammonia is about the same, though the decomposition-voltages vary greatly. The author also calls attention to the fact that strongly dissociated double salts (like the alums or double caesium halides) are as a rule less soluble than the component salts, though the assumed increase in electro-affinity should produce a greater solubility. A few other such discrepancies are also cited. A. A. NOYES.

On the Nature of Mercuric Iodide in Solution. BY J. H. KASTLE AND JEWETT V. REED. *Am. Chem. J.*, 27, 209–218.—Continuing the experiments (*this Rev.*, 6, 62) previously made in

Digitized by Google

the same laboratory, the authors find that from a supersaturated solution of mercuric iodide in naphthalene, the yellow form always separates, however the crystallization be started; this occurs even at 100°, although the red form is the stable one below 128°. Moreover, no crystallization is started by sowing the solution with the red form. The authors have also studied the relative stability of the yellow form when allowed to stand under various solvents, and find that viscous solvents, such as glycerine, cane-sugar solution, and vaseline, greatly retard the conversion to the red form. A. A. NOYES.

The Law of Physico-Chemical Change. BY GILBERT NEWTON LEWIS. *Proc. Am. Acad.*, 37, 49–69.—The article presents a new mathematical treatment, from the standpoint of a single general equation, of the various changes in state which any simple substance can undergo. A. A. NOYES.

The Decomposition of Mercurous Chloride by Dissolved Chlorides; a Contribution to the Study of Concentrated Solutions. BY THEODORE WILLIAM RICHARDS AND EBENEZER HENRY ARCHIBALD. *Proc. Am. Acad.*, 37, 347–361.—Concentrated solutions (1- to 10-fold normal) of hydrochloric acid, and of the chlorides of sodium, calcium, and barium, are found to dissolve considerable amounts (30 to 100 mg. for each gram-equivalent of salt) of mercurous chloride by causing it to decompose into mercury and mercuric chloride until an equilibrium is reached. The order of magnitude of the solvent-powers of these four substances is the same, while that of solutions of cadmium chloride is practically zero.

The authors show that the results lead to the following explanation. Mercurous chloride in pure water decomposes to a slight extent into mercury and mercuric chloride, and when chlorine ions are brought into the solution by the addition to it of a dissociated chloride, they partially unite with the mercuric chloride, forming the complex ion $HgCl_4''$, thus making it necessary that more mercurous chloride decompose, in order to restore the equilibrium. If this ion alone forms, the dissolved mercury must, according to the Mass-Action Law, be proportional to the square of the chlorine-ion concentration; and it is shown in fact that this holds true for hydrochloric acid at the two concentrations, normal and double normal, and that the divergence at higher concentrations is explained when the amount of undissociated H_2HgCl_4 that must be formed is taken into account. It is also shown that hydrochloric acid and calcium chloride have a maximum solvent effect on the mercurous chloride at nearly the same concentration, 6- to 7-fold normal, as that at which they exhibit a maximum specific conductivity and a maximum power of dissolving mercuric chloride. Cadmium chloride has no solvent-effect, because in such

Digitized by Google

concentrated solutions it is only very slightly ionized. It is suggested that the reaction may be of use as a means of determining the concentration of the chlorine ion. A. A. NOYES.

A New Investigation Concerning the Atomic Weight of Uranium. BY THEODORE WILLIAM RICHARDS AND BENJAMIN SHORES MERIGOLD. *Proc. Am. Acad.*, 37, 365–395.—Urano-uranic oxide prepared by purifying commercial uranium acetate was converted into uranous bromide by mixing it with carbon and heating it in a current of bromine, great care being taken to ensure complete absence of oxygen and moisture. The sublimed bromide was bottled and weighed without its once coming into contact with the air. It was dissolved in water, oxidized with hydrogen peroxide to uranyl bromide, and then precipitated with silver nitrate. From the ratio $UBr_4 : 4AgBr$ thus determined, the atomic weight was found to be 238.53, which is about one unit or 0.45 per cent. lower than the previous value of Zimmerman (239.6). A. A. NOYES.

The Spectra of Hydrogen and Some of Its Compounds. BY JOHN TROWBRIDGE. *Am. J. Sci.* (4), 12, 310–318.—The author describes further experiments in support of the view (see *this Rev.*, 7, 190) that the electrical conductivity of hydrogen, nitrogen, and oxygen is really due to the water-vapor present. He shows that the resistance of tubes containing hydrogen at a pressure of 1-2 mm. is increased even up to the point of exciting X-rays by the passage of a strong steady current, on account of the decomposition of this vapor by electrolysis. A. A. NOYES.

The Molecular Weights of Some Carbon Compounds in Concentrated Solutions with Carbon Compounds as Solvents. BY CLARENCE L. SPEYERS. *Am. J. Sci.* (4), 13, 213–223.—The relative lowering of vapor-pressure was determined by drawing currents of air through tubes containing various concentrated solutions and the pure solvents, and determining the relative loss in weight of the tubes. Water, toluene, and methyl, ethyl, and propyl alcohols were used as solvents, and urea, naphthalene, acetanilide, acenaphthene, resorcinol, and in one case benzamide, as solutes. The molecular weights were calculated both by the equation. $(p_0 - p)/p_0 = n/(n + N)$, and by the equation, $\log (p_0/p) = n/N$). In about half the combinations investigated, the values obtained by both equations diverge widely from the normal ones. In a few cases (urea in water, naphthalene and acenaphthene in toluene) the first equation gives normal values, while the second one does not. A. A. NOYES.

On the Determination of the Heat of Dissociation and of Combustion of Acetylene, Ethylene, and Methane. BY W. G. MIXTER. *Am. J. Sci.*, (4) 12, 347–357.—The heat of dissocia-

Digitized by Google

tion of acetylene was determined directly by exploding the pure gas within a bomb, and it was found in four determinations to be 53,200–53,400 cal. per mol., while the values calculated from the heats of combustion of the gas and its component elements by Thomsen and Berthelot are 47,770 and 51,400 cal., respectively. Determinations of the heats of dissociation of ethylene and methane by mixing them with acetylene and exploding gave somewhat discordant results. The molar heats of combustion of acetylene and ethylene at constant volume were found to be 312,900 and 344,600 calories, respectively. A. A. NOYES.

The Absorption Spectrum of Colloid Ferric Hydrate. BY B. E. MOORE. *Phys. Rev.*, 13, 246–249.—There is found to be a marked difference of a qualitative as well as quantitative nature between the absorption spectrum of ferric hydroxide prepared by dialysis and that of the equally concentrated hydrolysis-product of ferric chloride at room temperature (*this Rev.*, 7, 146). The author attributes this to the presence of crystalloid ferric hydroxide in the dialyzed solution. This solution accelerates the hydrolysis of ferric chloride to a somewhat smaller extent than does the hydrolysis-product, which would accord with the assumption that the former contains less colloidal hydroxide (*this Rev.*, 7, 145). A. A. NOYES.

On the Relation between Density and Index of Refraction of Air. BY HENRY C. GALE. *Phys. Rev.*, 14, 1–16.—From measurements made with a modified interferometer it is shown that the relation of Gladstone and Dale, $(n-1)/d = const.$, holds within 0.1 per cent. up to a pressure of 20 atmospheres. This is also true of the Lorenz-Lorentz equation. A. A. NOYES.

The Density and Surface-Tension of Liquid Air. BY CHAS. T. KNIPP. *Phys. Rev.*, 14, 75–82.—A few determinations of the density and three series of measurements of the surface-tension of liquid air at various stages during its evaporation are presented. By extrapolation from the time-curve it is concluded that the surface-tension of liquid air, when first made, is 9 to 10 dynes per centimeter. A. A. NOYES.

Crystallization under Electrostatic Stress. BY PAUL R. HEYL. *Phys. Rev.*, 14, 83–88.—Solutions of sulphur in carbon disulphide and of mercuric iodide in hot alcohol were allowed to crystallize between two dishes with tinfoil coatings connected to the terminals of an influence machine giving a spark 1 cm. long, or of an induction coil giving a spark 0.2 cm. long. The sulphur crystals separating under the electrostatic stress had the same angles and the same density as under ordinary conditions. The mercuric iodide still separated in the unstable yellow form.

A. A. NOYES.

Digitized by Google

On the First Plait in van der Waals' Free-Energy Surface for Mixtures of Two Substances. By CH. M. A. HARTMAN. *J. Phys. Chem.*, **5**, 425–497.—This lengthy article is divided into three parts. The first two are devoted to mathematical and graphical considerations relating to the subject stated in the title. The third part consists of a review, from the standpoint of the theory, of all existing investigations on binary mixtures. The article closes with an index to the literature on such investigations. A. A. NOYES.

The Influence of Electrical Waves on Chemical Action. By FELIX LENGFELD AND JAMES H. RANSOM. *J. Phys. Chem.*, **5**, 498.—Electrical waves of 300 meters' length produced by an influence machine cause in forty-eight hours no appreciable reaction between hydrogen and chlorine or hydrogen and oxygen. A. A. NOYES.

A New Proof of the Formula $dT = 0.02T^2/L$. By FELIX LENGFELD. *J. Phys. Chem.*, **5**, 499–501.—The proof, which is not based upon the second law at all, is erroneous, since at the start, in equating the work done and the heat absorbed in van't Hoff's cyclical process, the heat-effect (equivalent to RT) attending the reversible mixing of the solvent with the solution is left out of consideration. A. A. NOYES.

The Mathematical Expression of the Periodic Law. By S. H. HARRIS. *J. Phys. Chem.*, **5**, 577–586.—This article describes another fruitless attempt to derive functional relations of real significance and value between the atomic weights of the elements. A. A. NOYES.

Oxidation of Ferrous Solutions by Free Oxygen. By J. W. MCBAIN. *J. Phys. Chem.*, **5**, 623–638.—Ferrous sulphate, chloride, and acetate were oxidized by mixing their air-free acidulated solutions with water containing known amounts of dissolved oxygen; and the ferric salt produced was determined, after the addition of sulphocyanate, by colorimetric measurements.

Light and the presence of carbonic acid were found to have no influence on the reaction. The simplest results were obtained in the case of ferrous sulphate: with this salt the rate of the reaction was shown to be roughly proportional to the square of its concentration (between 0.02 and 0.5 normal) and to the first power of that of the oxygen, and nearly independent of the concentration of the sulphuric acid between 0.02 and 0.1 normal, but it was considerably decreased when the concentration of the acid was made normal; a neutral salt of the acid (sodium sulphate) on the other hand, added in relatively large amounts, accelerates the reaction. These same principles govern the reaction with ferrous chloride, except that below 0.1 normal the proportionality

Digitized by Google

between the square of its concentration and reaction-velocity does not hold, and that hydrochloric acid at normal concentration accelerates the reaction, instead of retarding it. With ferrous acetate, which was investigated at 0.02 and 0.06 normal, the velocity is very much greater than with the sulphate or chloride, varies roughly as the cube of its concentration, is greatly reduced by the addition of acetic acid, and is enormously increased by that of sodium acetate. There seems to be no single assumption that will explain all these results; but those with the ferrous acetate strongly indicate that it is mainly the undissociated ferrous hydroxide produced by hydrolysis that undergoes oxidation.

A. A. NOYES.

Some Applications to Chemistry of J. J. Thomson's Work on the Structure of the Atom. BY FELIX LENGFELD. *J. Phys. Chem.*, **5**, 639–642.—The article presents speculations on the difference in constitution of positive and negative ions and the corresponding atoms, on the mechanism of the potential difference between metals and their solutions, and on the constitution of the atoms with reference to the periodic properties of the elements.

A. A. NOYES.

The Optical Rotatory Power of Cane-Sugar when Dissolved in Pyridine. BY GUY MAURICE WILCOX. *J. Phys. Chem.*, **5**, 587–599.—The specific rotatory power of sugar in pyridine at 25° varies from 86.7° in 1 per cent. solution to 83.6° in 6.25 per cent. solution; the value of it in water is 66.6°. That of the 6.25 per cent. solution of sugar in pyridine is greatly decreased (to 73.2°) by mixing it with one-fourth the quantity of an equally concentrated solution in water, and that of the water solution is slightly reduced (to 66.0°) by the addition of one-fourth the quantity of the pyridine solution; the concentration-curve, therefore, exhibits a minimum. The effect of temperature-changes between — 10° and + 105° was also investigated, and found to be considerable. The boiling-point-raising was found to correspond to molecular weight values varying between 305 and 362, the theoretical value being 352. A. A. NOYES.

Solubility of Gypsum in Aqueous Solutions of Sodium Chloride. BY FRANK K. CAMERON. *J. Phys. Chem.*, **5**, 556–576.—The solubility of calcium sulphate in sodium chloride solutions at 23° and 30° increases very rapidly with their concentration up to normal concentration, and then much more slowly to a maximum value at about 2 ½ normal. At higher temperatures (52°–82°) similar results were obtained, though no maximum was observed. A theoretical interpretation of the results does not seem possible at present. A. A. NOYES.

Solubility of Gypsum in Aqueous Solutions of Certain Elec-

Digitized by Google

trolytes. By Frank K. Cameron and Atherton Seidell. *J. Phys. Chem.*, **5**, 643–655.—The solubility of gypsum at 23°–26° was determined in solutions of magnesium chloride, calcium chloride, and sodium sulphate, through a wide range of concentration. In the case of magnesium chloride, when its concentration has reached 1.3 molar, the solubility has increased to 4.23 times its value in pure water, but with further increase of concentration the solubility rapidly decreases, attaining its original value at about 4 molar. Calcium chloride reduces the solubility very rapidly at first, then more slowly, until at about 3.3 molar it becomes practically zero. Sodium sulphate also reduces the solubility rapidly at first, but at about 0.1 molar there is a sharp turn in the solubility-curve, and the solubility then steadily increases and attains its original value in a 0.9 molar solution. Experiments are also presented on the solubility of gypsum in sodium chloride solutions saturated at the same time with calcium carbonate.

A. A. Noyes.

Equilibrium between Carbonates and Bicarbonates in Aqueous Solution. By Frank K. Cameron and Lyman J. Briggs. *J. Phys. Chem.*, **5**, 537–555.—Ordinary air was drawn for several days or weeks through solutions of sodium, potassium, and magnesium carbonates with the view of bringing them into equilibrium with the carbon dioxide contained in the air. They were then titrated with acid potassium sulphate, using phenolphthalein and methyl orange successively as indicators, in order to determine the relative amounts of normal carbonate ($CO_3'' + OH'$) and of acid carbonate (HCO_3') present. In the cases of sodium and potassium, the proportion of acid carbonate was found to decrease from about 90 per cent. at 0.004 normal to 15–20 per cent. at 0.5 normal, after which it remained constant, even on greatly increasing the concentration. In the case of magnesium, the proportion of acid carbonate is nearly constant at about 50 per cent. between the concentrations of 0.001 and 0.007 molar; but the proportion exceeds 65 per cent. when solid magnesium carbonate is in contact with the solution. No quantitative application of the mass-action-law to this equilibrium is attempted.

A. A. Noyes.

Solubility of Calcium Carbonate in Aqueous Solutions of Certain Electrolytes in Equilibrium with Atmospheric Air. By Frank K. Cameron and Atherton Seidell. *J. Phys. Chem.*, **6**, 50–56.—The electrolytes whose influence on the solubility was studied, are sodium chloride, sodium sulphate, and sodium chloride in contact with solid calcium sulphate. The concentration of the chloride was varied from 0.17 to 4.5 molar, that of the sulphate from 0.019 to 1.8 molar. The temperature was 24°–25°. The results have no obvious theoretical significance.

A. A. Noyes.

Digitized by Google

Instantaneous Chemical Reactions and the Theory of Electrolytic Dissociation. By Louis Kahlenberg. *J. Phys. Chem.*, **6**, 1–14.—The author has established the following interesting facts:

The oleates of copper, nickel, and cobalt, dried at 110°, dissolve readily in cold, dry benzene, yielding solutions of similar colors to those of salts of the same metals in water. A solution of cobalt oleate in toluene is dark red when cold, but blue when hot.

Copper oleate in benzene was found by both the freezing- and boiling-point method to have an apparent molecular weight of about four times the normal value.

Five per cent. solutions of these salts in benzene do not conduct electricity better than pure benzene or than air. The same is true of benzene solutions of hydrochloric acid, and of stannic, phosphorous, arsenious, and silicon chlorides.

Sodium, magnesium, aluminum, and zinc have no action upon the copper oleate solution. But when dry hydrochloric acid gas is passed into it, a brown precipitate of cupric chloride instantly separates; and from the nickel and cobalt oleates, respectively, brownish-yellow and blue precipitates of the corresponding chlorides are immediately thrown down. The precipitation of the metals was, moreover, shown to be complete, though it is not stated in how short a time. Cupric chloride, contaminated with oleate, is precipitated from benzene solutions of copper oleate, also by the anhydrous chlorides of tin, phosphorus, arsenic, and silicon. Dry hydrogen sulphide throws down the metallic sulphides from the three oleate solutions in benzene immediately, and from the stannic chloride solution in benzene on standing over night.

In all these precipitation experiments, great care was taken to have all the substances anhydrous, though it is not clear that this was assured in the case of the solid oleates. It was shown that not only all of the reacting substances separately, but also the fresh mixtures of them, are perfect insulators. These results prove, as stated by the author, that metathetical reactions may take place instantaneously between substances whose conductivities show that they are not appreciably dissociated, and his work will have a valuable effect if it serves to check the tendency to extensions and applications of the Ionic Theory that lack experimental justification; thus, it does not follow from the fact that ionized substances undergo metathetical reactions instantaneously that no other substances will do likewise, nor from the fact that solutions of all completely dissociated copper salts are blue, that certain undissociated copper salts are not blue also.

Finally, the observations of the author in regard to the benzene solution of hydrochloric acid may be referred to. This solution

Digitized by Google

has no action on most of the metals, such as magnesium, iron, cadmium, even when they are in contact with platinum; but it acts readily upon both pure and amalgamated zinc, and the evolution of hydrogen is not affected, either as to its amount or its location, by contact with platinum, showing that there is no electrolytic effect as in water solution. The benzene solution of the acid has no action upon the dry carbonates of sodium, calcium, and barium; but it gives an immediate bulky precipitate with dry ammonia. A. A. NOYES.

Nitriles as Solvents in Molecular Weight Determinations. BY LOUIS KAHLENBERG. *J. Phys. Chem.*, **6**, 45–49.—In a preceding article (*this Rev.*, **7**, 151), the author gave the heat of vaporization data for calculating the molecular boiling-point raising of benzonitrile and acetonitrile. He now recalculates Werner's molecular weight determinations in benzonitrile of diphenylamine, mercuric chloride, mercuric iodide, and silver nitrate, and finds all the values to be one-third to one-half greater than the normal ones, even though the three salts are good conductors. He also presents new determinations in acetonitrile of the molecular weights of naphthalene (found 144, normal 128), diphenyl (found 167, normal 154), diphenylamine (found 128, normal 169), and silver nitrate (found 138, normal 170). The last value corresponds well with the degree of dissociat ion determined by conductivity measurements, but the author considers that the results in general are a striking illustration of the fact that there is no such simple relation between boiling-point and conductivity as the Ionic Theory requires. Until the great deviations in the case of the organic substances are explained, the results cannot, however, be fairly cited as an argument against the applicability of that theory even to these solvents. A. A. NOYES.

Inorganic Ferments. BY D. MCINTOSH. *J. Phys. Chem.*, **6**, 15–44.—Colloidal silver made by Bredig's method decomposes hydrogen peroxide in neutral or acid solution, but gradually passes into solution and loses this power. In the presence of sodium hydroxide the colloidal silver rapidly decomposes the peroxide, the rate increases with increasing concentration of the base till this reaches about $^1/_8$ normal, and afterwards greatly decreases; it increases with increasing concentration of the silver far more rapidly than proportionality would require. Judged from the constancy of the velocity-constants obtained in single experiments, the reaction is one of the first order; but no series of experiments was made in which the initial concentration of the peroxide was varied. Silver sulphate in alkaline solution, owing to its reduction to silver, decomposed the peroxide at about the same rate as a corresponding amount of colloidal silver. Soluble silver prepared by Carey Lea's directions acts somewhat more

Digitized by Google

slowly, owing to the larger size of its particles. Colloidal mercury prepared by Bredig's method acts in alkaline solution like colloidal silver.

The article also contains a large number of undigested and unsummarized data on the rate of decomposition of the peroxide by sodium, potassium, and ammonium hydroxides, and by sodium carbonate in the absence of colloids. A. A. NOYES.

Dielectric Constant of Paraffins. BY WILL G. HORMELL. *Am. J. Sci.* (4), 12, 433–446.—The dielectric constants of a number of samples of paraffin were determined by Drude's method. Their indices of refraction were also measured by an Abbé refractometer. An argon tube was found to give excellent results as an indicator for adjusting for resonance. The investigation includes also a determination of the relative velocities of 80-centimeter waves along magnetic and non-magnetic wires of different diameters. The results of the investigation may be summarized as follows:

		½ λ = 40.84 cm.		½ λ = 20.84 cm.	
Melting-point.	Density.	μ_1	k_1	μ_2	k_2
47.6°	0.894	1.46(2)	2.13(7)	1.48(8)	2.21(7)
50.2°	0.905	1.47(3)	2.18(0)	1.50(4)	2.26(2)
53.3°	0.907	1.48(3)	2.19(8)	1.50(2)	2.25(6)
56.2°	0.897	1.49(0)	2.22(1)	1.51(2)	2.28(6)

μ_3 for D line.	μ_4 for F line.	μ for $\lambda = \infty$ from μ_3 and μ_4.	μ for $\lambda = \infty$ from μ_1 and μ_2.
1.5380	1.5567	1.498	1.45(6)
1.5430	1.5589	1.509	1.46(2)
1.5505	1.5665	1.513	1.47(7)
1.5523	1.5684	1.519	1.48(5)

In the table are given the values of the indices of refraction (μ_1 and μ_2) and corresponding values of the dielectric constant (k_1 and k_2) for electrical waves of approximately 40 and 20 half-wavelengths respectively; also the values (μ_3 and μ_4) for the indices of refraction for the D and F lines, and those of μ for $\lambda = \infty$ as computed by Cauchy's formula both from μ_3 and μ_4, and from μ_1 and μ_2. From these results it appears that the dielectric constant increases as the melting-point of the paraffin increases, but decreases as the wave-length increases; this is also true in the case of light waves. It also appears that Cauchy's formula does not lead to consistent results when applied to long electrical and to light waves.

For oscillations as rapid as 800,000,000 per second, the velocity of electrical waves along magnetic and non-magnetic wires is the same, showing that the magnetic properties of iron do not follow such rapid changes. (St. John found, however, with oscillations of 115,000,000 reversals per second, a difference of from 1½ to 3 per cent. between iron and copper.) H. M. GOODWIN.

On the Dielectric Constants of Pure Solvents. BY HERMAN

Digitized by Google

SCHLUNDT. *J. Phys. Chem.*, **5**, 503–526.—This article forms a continuation of a previous paper (*this Rev.*, **7**, 115), on the dielectric constants of nitriles. A considerable number of solvents for which these data have been lacking were investigated by Drude's method and the following conclusions deduced from the results: (1) The values of the dielectric constants for the homologous series investigated, that of the amines, show a decrease with increase of molecular weight; (2) The introduction of the cyanogen group causes a greater increase in the value of the dielectric constant than that of any other radical studied; (3) The presence of cyanogen, amino, or nitro radicals in a compound does not produce anomalous absorption as does the hydroxyl radical (Drude); (4) Although many of the results obtained are in agreement with the Nernst-Thomson rule requiring proportionality between dissociating power of a solvent and its dielectric constant, a number of new exceptions are pointed out to which the author attaches so much weight as to declare the rule inadequate; (5) Proportionality between latent heat of vaporization and dielectric constant for homologous series (Obach's Law) holds only approximately for the nitriles. H. M. GOODWIN.

On the Dielectric Constant of Dilute Electrolytic Solutions. BY A. DE FOREST PALMER, JR. *Phys. Rev.*, **14**, 38–56.—The dielectric constant of dilute solutions of copper sulphate (maximum concentration about 0.003-normal) and of potassium chloride was determined for electrical oscillations of about 10^6 per second by means of an elegant method, for the details of which reference must be made to the original paper. Essentially it consisted in comparing the deflections of two similar quadrant electrometers, one filled with pure water, the other with the solution, when both were connected in parallel across a circuit in which oscillations were maintained by a suitable spark-gap. This spark-gap was connected to the outside coatings of two large Leyden jars, the inner coatings of which were attached to two long parallel wires which formed the circuit in which the oscillations were set up.

The results show that there is no difference between the value of the dielectric constant for dilute electrolytic solutions and the value for water, so long as the conductivity of the former does not exceed 2.5×10^4. This result holds for oscillations of about 10^6 per second. H. M. GOODWIN.

Measurement of the Internal Resistance of Galvanic Cells. BY C. H. AYRES, JR. *Phys. Rev.*, **14**, 17–37.—The internal resistance of five different cells was measured by a modification of Kohlrausch's alternating current method, so arranged with condensers connected in series with the known and unknown resistances forming the two arms of the bridge, that the resistance of the cell

Digitized by Google

on open and closed circuit could be determined. The results show that the internal resistance is independent of the strength of current flowing through the cell, a result in agreement with that found by Haagn, but at variance with the results of several other investigators. The theory of the bridge arrangement used is worked out in considerable detail. H. M. GOODWIN.

The Theory of the Electrolytic Rectifier. BY K. NORDEN. *Elec. World and Engineer*, 38, 681.—This article contains an excellent statement of the views which have been held regarding the action of the aluminum electrolytic alternating current rectifier. The theory that the current is choked in one direction by anodic polarization is untenable, as the polarization measured on open circuit is actually very small. The view that the choking action is due to the very high resistance of the film formed on the anode is more in agreement with observed facts, but fails to explain some of the phenomena observed. Kohlrausch's theory of polarization-capacity of metallic electrodes offers a still more satisfactory explanation, the film formed acting as the dielectric of a condenser of which the plates are the anode and a layer of electrically charged ions of the electrolyte respectively. This theory accounts for the light phenomena of phosphorescence and scintillation at aluminum anodes described by Polzeniusz and Andrews by attributing them to a silent and to a disruptive discharge of the condenser thus formed.

The author discusses the results of his previous investigation (*Ztschr. für Electrochemie*, 1899) on the chemical constitution of the film formed at the anode. A sufficient quantity of the film for analysis was obtained by the intermittent action of a current. It was found to consist of normal aluminum hydroxide, $Al_2(OH)_6$, and not the oxide. This substance, however, is more or less acted on by dilute sulphuric acid and forms a basic sulphate independently of any electrolytic action. The partial solution of aluminum hydroxide in electrolytes in general, owing to its double acid and basic reactions, is pointed out, and this is offered as an explanation of the fact that an anode film rapidly loses its insulating power after the cessation of the current. If this be true, the action may also take place while an alternating current is passing, thus permitting a current to pass across the film when the electrode becomes a cathode. The efficiency of different electrolytes in rectifying cells should, according to this view, vary according to their solvent power for the hydroxide film, a conclusion which is in agreement with the facts.

H. M. GOODWIN.

Theory of the Edison Nickel Iron Cell. BY E. F. ROEBER. *Elec. World and Eng.*, 37, 1105–1108; 38, 599–600.—In this paper the Ionic Theory is applied to the concentration changes which

Digitized by Google

may occur in the new Edison nickel-iron cell, and all similar cells in which the essential action of the cell in charging and discharging is the transport of oxygen from one electrode to the other. Potassium hydroxide being the electrolyte, the ions concerned in the conduction of the current through the cell are $K^{\cdot}$ and OH'. Assuming therefore that the reactions at the iron and nickel oxide plates on discharge are

$$Fe + 2OH = FeO + H_2O$$
$$\text{and } NiO_2 + 2K + H_2O = NiO + 2KOH \text{ respectively,}$$

and that Hittorf's transference numbers for $K^{\cdot}$ and OH', 0.25 and 0.75 respectively, are correct, the author shows that "when the battery gives out in discharge 1 ampere second, the changes in the battery due to the migration of the ions and to the electrochemical processes at the electrodes consist in the transfer of 0.000083 gram oxygen from the nickel plate to the iron plate, the transfer of 0.000146 gram potassium hydroxide from the solution at the iron terminal to the solution at the nickel terminal, and the transfer of 0.000094 gram water from the solution at the nickel terminal to the solution at the iron terminal." The concentration at the iron electrode decreases and that at the nickel electrode increases, but the total concentration of the liquid in the cell remains unchanged. This, unlike the effect in the lead accumulator where the concentration at both electrodes diminishes during discharge thereby causing a decrease in concentration of the whole solution, tends to cause a more rapid diffusion or equalization of concentration at the electrodes than in the lead cell, and bears out the claim made for the cell that during charge and discharge the concentration of the solution remains unchanged. As but few actual data on the cell have yet been published, an exact experimental verification of such theoretical conclusions is at present impossible.

In the second article the author points out that the concentration changes produced at the electrodes of the nickel-iron cell are independent of the nature of the electrodes, *i. e.*, whether the oxide be NiO_2 or Ni_2O_3. An exact knowledge of the reacting substances is required, however, in order to calculate the electromotive force of the cell by Thomson's rule. Of the three reactions proposed,

$$NiO_2 + Fe = NiO + FeO \text{ (Edison)}$$
$$2NiO_2 + Fe = Ni_2O_3 + FeO \text{ (Marsh)}$$
$$\text{and } Ni_2O_3 + Fe = 2NiO + FeO,$$

data are available for the last reaction only. The computed value of thermochemical electromotive force is $1.47 - (-0.04) = 1.51$ volts, 1.47 volts corresponding to the heat of formation of FeO from Fe and O, and -0.04 volt to the endothermic reaction $2N : O + O = Ni_2O_3$. Kennelly gives 1.5 volts as the initial

Digitized by Google

voltage of discharge which is in good agreement with the value calculated. H. M. GOODWIN.

Theory of the Edison Nickel-Iron Cell. BY WOOLSEY MCA. JOHNSON. *Elec. World and Eng.*, 38, 733.—The author believes that concentration-changes produced at the plates of the cell during discharge can have but little effect on the electromotive force. He attributes the fall in potential to changes in the resistance of the electrodes and of the solution rather than to the concentration cell produced. H. M. GOODWIN.

Theory of the Edison Nickel-Iron Cell. BY E. F. ROEBER. *Elec. World and Eng.*, 38, 931.—In a reply to the preceding article, it is pointed out that Nernst's theory is applicable to reversible electrodes only, and until the ions with respect to which they are reversible are known, the effect of concentration changes on the potential differences at the electrodes cannot be computed. H. M. GOODWIN.

The Edison Storage Battery. *Elec. World and Eng.*, 38, 647–648.—Edison has patented a new modification of his storage battery in which zinc is the oxidizable electrode, oxide of copper or of nickel the depolarizer, and an alkali zincate the electrolyte. The inventor claims to have made this already familiar cell reversible by observing certain precautions in the preparation of the electrodes. The copper oxide electrode is prepared by first reducing copper carbonate by hydrogen at the lowest possible temperature, and moulding it into the desired form for the electrodes. These are next oxidized to cupric oxide by heat and finally reducing again to metallic copper electrolytically. Copper thus prepared if oxidized to cuprous oxide by charging the cell, is said to give an oxide which is insoluble. A non-spongy, coherent deposit of zinc is obtained by using a thin multi-perforated sheet of magnesium as the electrode support. H. M. GOODWIN.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

An Experimental Investigation into the Flow of Marble. BY FRANK D. ADAMS AND JOHN T. NICHOLSON. *Canadian Record of Science*, 8, 426–436.—This is a summary of work done at McGill University, an extended account of which has been published in the transactions of the *Roy. Soc.*, of London. To the geologist the results are of special value and interest since they afford a satisfactory demonstration of how the most violently contorted structures of stratified rocks may have originated.

Polished columns of Carrara marble 0.8–1 inch in diameter and about 1.5 inches in length, which succumbed to a crushing pressure of 11,430 and 14,026 pounds per square inch, were accurately fitted into cylinders of Low Moor iron of special construction, and

Digitized by Google

pressure up to 13,000 atmospheres was applied to the ends of the columns. At about 18,000 pounds' pressure the iron immediately surrounding the marble began to bulge, and when signs of rupture appeared the experiment was stopped. The duration of an experiment varied from ten minutes to sixty-four days, and the experiments were made under four conditions: in absence of moisture at ordinary temperatures, at 300° C., at 400° C., and at 300° in the presence of moisture. Except for "two blunt cones of obtuse angles whose bases are the original ends of the columns resting against the faces of the steel plugs," the deformed marble is dead white, somewhat chalky in appearance. Crushing tests on marble deformed at the ordinary temperature showed it to be much weaker (5350–2776 pounds per square inch) than the original rock, and that it is weakest when the deformation has been most rapid. Marble deformed in absence of moisture at 300° showed a strength of 10,652 pounds per square inch, and at the same temperature in presence of water forced through under a pressure of 460 pounds it became actually somewhat harder than the fresh stone. In the latter case, the structure developed was identical with that of marble deformed at 300° in the absence of moisture, hence, the presence of water is without apparent influence. The deformation at ordinary temperature was found to be due to a cataclasmic structure, and in part to twinning and gliding movements in the individual crystals of the rock. At 300°, and still better at 400°, the whole movement is due to changes in the shape of the calcite crystals by twinning and gliding, a movement identical with that produced in metals by hammering or squeezing. From work now in progress it is believed "that similar movements can, to a certain extent, at least, be induced in granite and other harder crystalline rocks." W. F. HILLEBRAND.

Nineteenth Ann. Rep. New York State Geologist. By FREDERICK J. H. MERRILL. *53rd Ann. Rep. New York State Mus.*, 1899, pp. 11-1170.—Besides the administrative report of the director this volume contains the following geological papers: *Preliminary Report on the pre-Cambrian Formations in Parts of Warren, Saratoga, Fulton and Montgomery Counties*, by J. F. KEMP AND B. F. HILL, pp. 17–35; *Geology of Rand Hill and Vicinity, Clinton County*, by H. P. CUSHING, pp. 36–82, containing analyses by E. W. Morley of a quartz-anorthosite gabbro from Carne's quarry, Rand Hill, and of a hyperite gabbro from Hopkinton, St. Lawrence County, in the Adirondacks. *Geology of the Crystalline Rocks in the Vicinity of the St. Lawrence River*, by C. H. SMYTH, JR., pp. 83–104; Oil and Gas in Southwestern New York, by IRVING P. BISHOP, pp. 105–134; *Roofing Slate Quarries of Washington County*, and *Emery Mines of Westchester County*, by J. N. NEVIUS, pp. 135–154.

W. F. HILLEBRAND.

Digitized by Google

Petroleum and Natural Gas in New York. By EDWARD ORTON. *Bull. New York State Mus. No. 30, in 53rd Ann. Rep. New York State Mus.*, pp. 396–526.—In this report is the following analysis by Durand C. Woodman of gas from Baldwinsville, Onondaga County, representing the composition of the Trenton Limestone Gas of New York: CH_4, 98.40; CO, 0.95; illuminants, diffused, 0.25; N by difference, 0.40; H, trace; O, trace; C_2H_2 and CO_2, absent; spec. grav. by calculation, 0.558; heat units a cubic foot, 1013.5. There are also four analyses of limestone of Trenton age and three of Utica shale, all by Edward Orton, Jr. W. F. HILLEBRAND.

The Saddle Reefs of Bendigo. By T. A. RICKARD. *Eng. and Min. J.*, 73, 440–443.—This is an entertaining and instructive review of the peculiar ore formations in this famous district, called forth by the recently opened 50-year jubilee exhibition at Bendigo. W. F. HILLEBRAND.

The Sulphur Deposits of Calcasieu Parish. By FRANK M. KERR. *J. Assoc. Eng. Soc.*, 28, 90–97.—This is mainly a history of several unsuccessful attempts since 1868 to reach by mining operations the wonderful sulphur deposits that have been shown by borings to underlie portions of this region in Southwestern Louisiana. The records of two borings to depths of 1230 and 603 feet respectively are given. The company at present operating dispenses with shafts and forces hot water by the aid of pipes (Frasch process) down to the requisite depth, where it is kept under high pressure, melts the sulphur, and forces it to the surface through interior pipes. The author believes "that there is a limit to the extent to which the sulphur strata can be chambered by this process.... and that it will be necessary to constantly change the base of operations for extracting the deposits, ..." But he is confident that the field is susceptible of much greater development, possibly by other methods, and also that "oil fields of large extent and superior quality" will soon be discovered. W. F. HILLEBRAND.

The Classification of the Crystalline Cements. By EDWIN C. ECKEL. *Am. Geol.*, 29, 146–154.—The author's "scheme of classification presented below is based primarily upon the amount of chemical change caused by the processes of manufacture and use; and secondarily upon the chemical composition of the cement after setting. Though not perfect it is believed to be more consistent and complete than any hitherto used."

I. *Simple Cements.*

a. Hydrate Cements; set due to reabsorption of water.

b. Carbonate Cements; set due to reabsorption of carbon dioxide.

Digitized by Google

II. *Complex Cements.*

a. Silicate Cements; set due to the formation of silicates.

b. Oxychloride Cements; set due to the formation of oxychlorides.

Brief statements of the composition, preparation and characteristics of these several classes follow, and it is stated that a more detailed discussion of the technology and properties of the various cementing materials will be published in a technical journal.

W. F. HILLEBRAND.

Sketch of the Iron Ores of Minnesota. By N. H. WINCHELL. *Am. Geol.*, **29**, 154–162.—The discovery, geological relations, and the theories of Irving, Wadsworth, Spurr and the author as to the origin of the ores are briefly stated and in part discussed. The author deduces from his own theory the conclusion that there is "no theoretic reason to expect that the Mesabi ore is near its exhaustion. On the contrary, the present productive area can hardly be expected to be its greatest, but new discoveries are likely to greatly enhance its volume and its geographic range." (See in this connection the final paragraph of abstract on the "Iron Ores of the Lake Superior Region," by C. R. van Hise, **24**, 147). W. F. HILLEBRAND.

Origin and Distribution of Minnesota Clays. By CHARLES P. BERKEY. *Am. Geol.*, **29**, 171–177.—"This article is intended to group the facts known as to the origin of the Minnesota clays and to point out typical representatives of each geological class." "The large clay-working establishments of the state are using either *clay shales* or *stream deposits* or *glacial-lake clays*. The smaller and scattered brick plants of chiefly local importance are using *till* and modified drift or *residuary loess* and 'loam clays.'"

W. F. HILLEBRAND.

Geological History of the Hematite Iron Ores of the Antwerp and Fowler Belt in New York. By W. O. CROSBY. *Am. Geologist*, **29**, 233–242.—The author opposes the theory of C. H. Smyth (*Bull. Geol. Soc. Am.*, **6**, 4) that the chloritic rock in which the ore occurs is a highly altered phase of the neighboring granite, and holds it to be probably a highly altered basic eruptive dike, perhaps diabase, from which rock the ore was originally separated by magmatic segregation. W. F. HILLEBRAND.

The Old Tungsten Mine at Trumbull, Connecticut. By WILLIAM HERBERT HOBBS. *U. S. Geol. Survey, 22nd Ann. Rep., Part II*, pp. 7–22.—This well-known locality for tungsten and associated minerals has been opened up since 1898 by exploitations in search of wolframite and scheelite in commercial quantities, and thus has been afforded opportunity for better study of the geological conditions than was hitherto possible, although the

Digitized by Google

mining operations have been unsuccessful and are now discontinued. A bed of limestone, 20–30 feet thick, between bodies of hornblende-gneiss, has afforded, by its susceptibility to metamorphism in contact with igneous intrusives, such as the gneiss is supposed to be, altered contact zones several feet in thickness in which occur the tungsten and other minerals. The gneiss as well as the limestone shows much alteration. The tungsten ore is particularly concentrated just below the lower limestone contact, but its lateral distribution is extremely variable. Noteworthy is the fact that while the ore is mostly wolframite in composition it occurs, not in its own crystal forms, but as pseudomorphs after scheelite. W. F. HILLEBRAND.

Geology and Ore Deposits of the Elkhorn Mining District, Jefferson County, Montana. BY WALTER HARVEY WEED. With an Appendix on the Microscopical Petrography of the District. BY JOSEPH BARRELL. *U. S. Geol. Survey, 22nd Ann. Rep., Part II*, pp. 399–549.—Although the district can boast of but one producing mine of importance, and that is now closed down, it was in operation for many years, and its deposits were somewhat unique among those of Montana. "It was found that the ore deposit occurs on the border of a great area of granite, and that in the immediate vicinity of the deposit there have been successive intrusions of igneous rock, breaking up through folded sedimentary and earlier igneous rocks. The district thus offered peculiarly favorable opportunities for a study of the relations of the igneous rocks to one another, and of the effect produced by such intrusions upon adjacent sedimentary rocks." The igneous rocks are the leading feature of the geology of the district, and embrace a number of types. Of these are described quartz-monzonite and aplite-granite, gabbro and diorite, diorite-porphyry, quartz-diorite-porphyry, and andesites. Accompanying the descriptions are analyses by Stokes of most of them, together with several from other sources for comparison. Hydrothermal metamorphism of both the sedimentary beds and later igneous rocks, caused by the intrusion of great bodies of molten magma, is a pronounced feature. In the extensive workings of the Elkhorn mine the deposits occur on the under side of pitching anticlinal folds, an evidence of ascending waters, which are supposed to have been hot and to have derived their metallic contents from igneous rocks (gabbro) below the replaced limestones. Space does not permit of any adequate review of this interesting report. W. F. HILLEBRAND.

The Physical Effects of Contact Metamorphism. BY JOSEPH BARRELL. *Am. J. Sci.*, 13, 279–296.—This essay treats of the little-studied subject of alteration in volume of sediments with attendant shrinkages and pressure changes resulting from libera-

Digitized by Google

tion of gases, due to contact with igneous masses, and the possible results in the formation of vein fissures, impregnation deposits, and new intrusions of igneous matter. Manifestly the rocks subject to the greatest changes in volume and mass in contact with igneous masses " are carbonate rocks containing sufficient silica to combine with all the bases, to the complete expulsion of the carbon dioxide." The subject of the decomposition of igneous rocks by weathering is first considered at some length, and it is concluded that the amount of combined water in a sediment "may be taken as an indicator of the completeness of weathering." Next are considered the changes in mass and volume produced by igneous contact. All the water is expelled except from a few metamorphic minerals like epidote, vesuvianite, and biotite. At great depths " carbon dioxide is only expelled when the siliceous impurities in the limestone are sufficient to combine with the lime set free, forming lime silicates." A table showing the loss in weight of pure and mixed types of sediments is given. The more striking loss in volume is compounded of three factors: decreased porosity, loss of water and carbon dioxide, and crystallization into minerals of greater density. Their combined effect may occasionally cause a shrinkage of 50 per cent. The geological consequences of such changes are then taken up in detail. First the relation of metamorphic minerals to the original composition of the sediment is discussed, and assuming a very simple composition for the latter—quartz-sand and carbonates—a table is given showing how the composition of the original sediment may be arrived at from a knowledge of the mineral composition of the metamorphic rock as revealed by thin sections, and what changes in both mass and volume the sediment has undergone. The question of possible infiltration of other matter, as silica, as a result of shrinkage, is taken up, and on theoretical grounds as well as field observations it is concluded that in deep-seated metamorphism this infiltration is very slight. The gases in their slow escape exert enormous pressure, and while they are passing off recrystallization is already in progress and the rock becomes dense before heated waters can gain access to it. Two instances from the writer's experience are given, however, to show that exceptionally metasomatic infiltration does take place. Next are considered the effects of wall shrinkage on the magma, which will be different according as the magma solidifies soon after intrusion or remains long liquid. Finally, as a minor cause in producing subordinate volcanic phenomena it is suggested that the carbon dioxide and heated water escaping from the sediments in contact with igneous masses play a part. The author's illustrations and field observations are drawn from the Elkhorn District in Montana (see preceding abstract).

W. F. HILLEBRAND.

Digitized by Google

Leucite-Tinguaite from Beemerville, New Jersey. By JOHN E. WOLFF. *Bull. Mus. Comp. Zool.*, 38, 273–277.—This rock occurs as a dike of limited exposure in the elaeolite-syenite, two miles northwest of Beemerville. The microscope shows "Phenocrysts of nepheline and pseudo-leucite; few crystals of augite and occasional plates of biotite. Ground mass: aegerine-augite needles, orthoclase, nepheline as essentials, with a little analcite, biotite, calcite, etc." Analysis gave: SiO_2, 50.00 per cent.; Al_2O_3, 20.03; Fe_2O_3, 0.98; FeO, 3.98; MgO, 0.69; CaO, 3.41; Na_2O, 8.28; K_2O, 8.48; H_2O above 110°, 1.50; H_2O below 110°, 0.10; CO_2, 0.22; TiO_2, 0.99; P_2O_5, 0.21; FeS_2, 0.54; F, not determined; Cl, trace; MnO, 0.50; BaO, none; total, 99.87 per cent. Spec. grav. at 20°, 2.701. The striking excess of ferrous over ferric iron distinguishes the rock from allied tinguaites, and in calculating the mineral composition it seems necessary to assume the existence of a hypothetical silicate of sodium and *ferrous* iron. Reproduced analyses of the elaeolite-syenite of Beemerville and of leucite-tinguaites from Magnet Cove and Bear Paw Mountains are given. The latter differ mineralogically from the Beemerville rock by containing sodalite. W. F. HILLEBRAND.

Apatite from Minot, Maine. By JOHN E. WOLFF AND CHAS. PALACHE. *Proc. Am. Acad. Arts and Sci.*, 37, 517–528.—This apatite is noteworthy for its rich purple color. About 2000 loose crystals and fragments were found in a cavity in pegmatite granite with numerous other minerals—quartz, orthoclase, lepidolite, albite, muscovite, cookeite—in five generations of deposition. Certain faces of the apatite show marked striations, due in part doubtless to oscillatory combination of certain planes, but in others apparently the result of etching. Analysis by Wolff gave: P_2O_5, 41.30 per cent.; $(FeAl)_2O_3$, 0.71; MnO, 0.85; CaO, 53.43; MgO, 0.70; K_2O, 0.27; Na_2O, 0.36; H_2O, 0.29; Cl, none; F, 2.38; loss at 320°, 0.04; less O for F, 1.00; total, 99.33 per cent. These figures give the ratio P_2O_5 : RO : F.OH :: 1.5 : 5.13 : 0.85. The mineral seems to be a pure fluorapatite free from chlorine, but somewhat deficient in fluorine for the formula $Ca_5F(PO_4)_3$, even when the water is regarded as hydroxyl, replacing fluorine. The perfect freshness of the crystal analyzed forbids the assumption that the water is due to alteration. From a study of the available and somewhat defective data as to specific gravity, birefringence, and chlorine and fluorine content of apatites, the authors cannot regard the theory of Pusyiewsky and Baumhauer as established, that the axial ratio decreases with chlorine content. They also find that no definite relation exists between specific gravity and chlorine content as maintained by Pusyiewsky.
W. F. HILLEBRAND.

The Ore Deposits of the Rico Mountains, Colorado. By FRED-

Digitized by Google

ERICK LESLIE RANSOME. *U. S. Geol. Survey, 22nd Ann. Rep.*, pp. 229–397.—This report is a companion and partly supplementary to that of Messrs. Cross and Spencer on the geology of the Rico Mountains (This Journal, R. **24**, 143). The ores occur in four forms of deposits: lodes, blankets, replacements in limestone, and stocks, of which the second comprises or comprised (for the region appears to be pretty well worked out) the more valuable ore bodies. It is impossible to review here the very interesting discussion of the relation of these forms to each other, particularly of the first two, and to the adjacent rock formations. A striking feature of the lodes is the limited vertical range, not exceeding 200 feet, of the pay-ores below the blanket deposits against which the lodes generally terminate above. Chemical analyses by the reviewer, of limestone, gypsum and sandstone, and of the residues from leaching of large bodies of them, have aided in arriving at an understanding of the origin of the blanket formations in which the richer ore bodies were mainly found. Noteworthy with respect to the sandstone from the Logan mine is the presence of 0.04 per cent. of silver, equivalent to $11^1/_2$ oz. per ton. The leaching and alteration of the gypsum bed gives rise to a gray silty material characteristic of the lower portion of the blanket in some mines. In the Rico-Aspen mine this showed a percentage of strontia of 19.5 against 0.10 per cent. in the unaltered gypsum. The result of leaching of limestone is a sooty powder whose constituents are mostly residual, though some may be, in part at least, of later introduction. The composition of limestone (I) and of its alteration product (II) from the Forest-Payroll mine are essentially as follows:

	CaO	MgO	CO_2	H_2O 110°−	H_2O 110°+	SiO_2	TiO_2	Al_2O_3
I.	39.15	2.29	30.86	0.51	0.66	23.51	0.06	1.56
II.	1.06	14.21	0.17	7.33	8.88	29.29	0.27	12.56

	Fe_2O_3	FeO	MnO	MnO_2	ZnO	CuO	PbO_2	Alk.	P_2O_5
I.	0.30	0.56	0.54	....	ft. tr.?	ft. tr.?	....	?	tr.
II.	5.36	....	....	13.27	1.65	0.40	5.21	0.20	0.14

Limestone from the Logan mine shows 0.03 per cent. CuO and 0.09per cent. ZnO. Halloysite from the Logan mine and impure jarosite from the Pigeon mine are also represented by analyses.

W. F. HILLEBRAND.

Geological Relations and Distribution of Platinum and Associated Metals. BY JAMES FURMAN KEMP. *U. S. Geol. Survey, Bull. No.* 193 (1902), 95 pp.—In the earlier pages of this work are tabulated 42 analyses of native platinum, 2 of platiniridium, and 12 of iridosmine. Not included in this table are some of the analyses scattered through later pages. None of these is of very recent date, but they form a useful compilation of data showing the composition of the alloys from different quarters of

Digitized by Google

the globe. The same may be said of some of the descriptive matter relating to foreign occurrences taken from sources quite inaccessible to most readers. Following the section on platinum minerals are reviewed those minerals associated with platinum, both in the nuggets themselves and the gravels, and then the subject of platinum in country rock, in tetrahedrite, etc., in Australian coal, and meteorites is briefly considered. Next the localities of occurrence are reviewed in detail, considerable attention being given to British Columbia, certain parts of which the author himself has studied. Here the only new analytical matter of the report appears—results of assays of about 35 platinum-bearing rocks from the Tulameen district, and an analysis by the reviewer of peridotite (variety dunite) from Eagle Creek, a branch of the Tulameen river, British Columbia. Notwithstanding wide search by the author in that region, no nuggets in place could be found, although assays repeatedly showed the presence of metal. The report closes with a statement of the types of ore deposits and mineralogical associations which the facts set forth make it possible to establish, to which are added the following conclusions of practical value: (1) "Experience thus far gained leads to the conclusion that platinum is very sparsely distributed in its mother rock and that the chances of finding it in quantities sufficient to mine are small. There is nevertheless a chance. If found, the recovery of the platinum by any means other than stamping and washing remains to be solved, and as the metal may be in a very finely disseminated state this problem is a serious feature of the situation;" (2) "Large and permanent placers are to be looked for only in very old land areas which have been subjected to protracted degradation and concentration;" (3) "In the assay of antimonial, arsenical and other copper ores, but especially of tetrahedrite (gray copper or fahlerz), it is worth while to look for small percentages of platinum;" (4) "Deposits of chromite deserve similar testing." (This Journal, R. **24**, 128.)

W. F. HILLEBRAND.

Unpublished Nebraska Meteorites. BY E. H. BARBOUR. *Proc. Nebraska Acad. Sci.*, **7**, 1897–1900 (issued November, 1901), pp. 34–35.—To the single known authentic meteorite from Nebraska, that of York County, are added two more, both like the first, of the iron type. One of 6.13 lbs. weight, is from Red Willow County, the other, of 12 oz. weight, is said to have been seen to fall in Rock County, October 16, 1898. Figures of both accompany the paper, but no analytical data. Two others, one an iron and the other a stone, are reported but have not been fully authenticated. W. F. HILLEBRAND.

Origin and Classification of Gneisses. BY C. H. GORDON. *Proc. Nebraska Acad. Sci.*, **7**, 1897–1900 (issued November,

Digitized by Google

1901), pp. 90–96.—A paper devoid of chemical data but containing a proposed system of classification of igneous and metamorphic rocks, the main features of which have appeared in the *Bull. Geol. Soc. Am.*, 7, 122. W. F. HILLEBRAND.

Gold in North Carolina. BY FREDERICK MOORE. *Sci. Am. Suppl.*, 53, p. 21,918.—A résumé of the history of gold mining in the state, and a statement of present conditions and prospects. W. F. HILLEBRAND.

On the Occurrence of Free Sulphur in Beaumont Petroleum. BY CLIFFORD RICHARDSON AND E C. WALLACE. *Jour. Soc. Chem. Ind.*, 21, 316–317.—After first being freed from hydrogen sulphide by a current of air, the oil carried 1.75 per cent. of sulphur and had a density of 0.914. Then after very slow filtration upward through 19 inches of kaolin under a clear head of 37 inches, it was found to be deprived of a large part of its sulphur. The first fraction, 5 cc. water-white, of sp. gr. 0.8755, held 0.80 per cent. of sulphur; the second, 21 cc. pale lemon, of sp. gr. 0.8986, held 0.91 per cent.; and the third, 8 cc. deep lemon, of sp. gr. 0.9038, held 1.04 per cent. Succeeding fractions up to 8, in which sulphur was not determined, increased in color and density, but all were free from the rank odor of the original oil. The denser fractions on standing a month or more deposited fine crystals of sulphur amounting to 0.25 per cent. in all. The possibility of the formation of free sulphur by partial oxidation of sulphur compounds by air in the pores of the kaolin is considered, but, on the whole, the evidence seems to the author to point to the presence of free sulphur in the oil as it comes from the well. The limestones in which the oil occurs contains sulphur crystals. "The presence of free sulphur also accounts for the variable nature of the product obtained, on varying the conditions under which the oil is heated, the amount of hard residue reaching in some cases to no more than 10 per cent., and under other conditions to as much as 35 per cent. The sulphur seems, therefore, to be the cause of the great instability of this interesting oil." W. F. HILLEBRAND.

Analysis of Mount Vernon Loess. BY NICHOLAS KNIGHT. *Am. Geol.*, 29, 189, and *Am. J. Sci.*, 13, 325.—A specimen of loess used for making a good quality of brick in Mount Vernon, Iowa, has the following composition according to Frank Hanna, of Cornell College, of that place: SiO_2, 70.86 per cent.; CO_2, 4.70; Fe_2O_3, 2.97; Al_2O_3, 8.91; MnO_2, 0.28; CaO, 4.13; MgO, 3.12; K_2O, 1.18; Na_2O, 1.69; TiO_2, 0.59; P_2O_5, 0.40; FeO, 0.10; H_2O, 1.10; total, 99.98 per cent. W. F. HILLEBRAND.

The Berkeley Hills, a Detail of Coast Range Geology. BY ANDREW C. LAWSON AND CHARLES PALACHE. *Bull. Dept. Geol.*,

Digitized by Google

Univ. of California, **2**, 349–450. Plates and map.—The area of the Berkeley Hills covered by this essay is about six square miles, an area characterized by great variety of formations and complexity of structure, which, because of its close proximity to the University of California, has served for eleven years as a training ground for the geological classes of that institution. Among the volcanic rocks the andesitic, which may all be classed as pyroxene andesites, present numerous structural variations. Analyses are given of the four principal types. The basaltic lavas, hardly subordinate to the andesitic, show local structural variations and are represented by three analyses. Most of the analyses are by Palache. Rhyolitic tuffs and agglomerates and basaltic tuffs comprise the pyroclastic rocks. The lavas and rhyolite tuffs in the Berkeleyan and Campan series show in ascending order five and perhaps six recurrences or periods, in four of which at least the sequence is andesite, basalt, rhyolite. W. F. HILLEBRAND.

ANALYTICAL CHEMISTRY.

The Estimation of Copper as Cuprous Sulphocyanide in the Presence of Bismuth, Antimony, Tin, and Arsenic. BY R. G. VAN NAME. *Am. J. Sci.*, **163**, 138–144.—In the first series of experiments the author tried the separation of copper from varying amounts of arsenic, bismuth, and antimony taken as H_3AsO_3, $BiCl_3 + HCl$, and $SbCl_3 + HCl$. Different quantities of ammonium bisulphite, hydrochloric or sulphuric acid, and in some cases, tartaric acid were added to the solutions, but the excess of ammonium sulphocyanide above that required to precipitate the copper was constant and comparatively slight.

The results obtained for the separation of copper from arsenic and from antimony were satisfactory, but the filtrate from the solutions containing bismuth always gave decided tests for copper when concentrated and treated with potassium ferrocyanide. On a slight change of conditions some of the bismuth was precipitated.

In the second series of experiments a decided excess of ammonium sulphocyanide was used. The separation of copper and tin taken as $SnCl_2 + HCl$ and $SnCl_4 + HCl$ was tried and found to work successfully when the tin was in the higher condition of oxidation. The increased amount of ammonium sulphocyanide also caused a satisfactory separation of copper and bismuth.

The tendency of cuprous sulphocyanide to pass through the filter may be almost completely overcome by precipitating it with a considerable excess of ammonium sulphocyanide in the presence of a moderate amount of free acid. B. S. CUSHMAN.

Report of the Sub-Committee on Uniformity in Analysis of Materials for the Portland Cement Industry. *J. Soc. Chem.*

Digitized by Google

Ind., 21, 12–30.—In April, 1901, the subcommittee, appointed by the Chairman of the New York Section of the Society of Chemical Industry to investigate the subject of the methods of analysis of materials pertaining to the Portland cement industry, sent out a circular requesting chemists interested in that line of work to join them in analyzing samples of a raw cement mixture and a finished Portland cement, and to furnish detailed descriptions of the methods of analysis employed.

The actual composition of these samples was established by the analyses of Mr. W. F. Hillebrand of the United States Geological Survey Laboratory and his review of the results and methods of the technical chemists and his suggestions for a method to bring about uniformity in the work of these men were of invaluable aid to the committee.

The results received from fourteen different chemists showed high and low results as follows:

LIMESTONE MIXTURE.

	SiO_2.	Al_2O_3.	Fe_2O_3.	CaO.	MgO.	Loss on ignition.	SO_3.
High	21.16	6.64	2.73	41.92	2.14	35.42	....
Low	12.78	5.27	1.26	39.53	1.10	34.00	....

FINISHED CEMENT.

High	21.56	8.20	3.76	64.30	3.13	3.20	1.71
Low	19.18	6.26	2.30	62.01	2.52	1.04	1.30

Nearly all of the results obtained for silica are too low. This proves that a single evaporation to dryness followed by a subsequent heating of the residue in a steam- or hot air-bath is not sufficient to completely dehydrate the silica. Although the results are too low the silica as weighed probably contained other substances, for no attempt was made to correct with hydrofluoric acid. The chief sources of error in determining the alumina seem to have been the lack of a double precipitation and the consequent contamination of the precipitate with lime. High results are also due to the presence of silica in the precipitate and to insufficient heating during ignition.

In nearly all cases the results for iron were obtained by reducing the solution with zinc and titrating with permanganate. The high results are due in part to the reducing action of nascent hydrogen on the titanium in the solution but the error in some of the results must have been due to carelessness.

The determination of lime was made after a single precipitation as oxalate either by titration with permanganate or by ignition and weighing as oxide. In one case the lime was weighed as sulphate. Low results by either method are due to a loss of lime in the alumina precipitate or to washing with a large quantity of hot water in which calcium oxalate is appreciably soluble. High results are due to the inclusion of magnesium oxalate, etc., or to insufficient heating over the blast-lamp. Some analysts allowed

Digitized by Google

only ten to twenty minutes between the precipitation and filtration of the oxalate, whereas two to three hours are required for complete precipitation.

The high results for magnesia are due to the contamination of the precipitate by lime, alumina or silica and by failure to heat sufficiently to convert the precipitate to $Mg_2P_2O_7$.

In manganiferous limestones and cements the manganese, if not separated, will be distributed through the Al_2O_3, etc., CaO and $Mg_2P_2O_7$.

The prevailing practice of calculating all the calcium and magnesium to carbonates gives incorrect results, for when silicates and phosphates are present a portion of these bases must be combined otherwise than with carbonic acid. When a direct determination of carbon dioxide has been made it should not be distributed between the lime and magnesium for a part, if not all, of the iron and manganese may be present as carbonates. If any portion of a limestone or finished cement resists the action of hydrochloric acid it should be filtered off without evaporation and fused with sodium carbonate. The hydrochloric acid solution of this fusion should be added to the first filtrate and the solution evaporated for silica as usual.

The wide variations in the loss on ignition are undoubtedly due to the absorption of water and carbon dioxide by the cement. All samples of cement which are to be analyzed by different chemists should be sealed air-tight and not opened until the analysis is to be made.

In determining the sulphur the usual evaporation to dryness after decomposing with acid is unnecessary, as silica will not be precipitated if the volume of the solution is above 200 cc. It is never safe to determine the sulphur in a solution from which iron and aluminum have been removed by precipitation with ammonia as some sulphur may have precipitated as basic aluminum sulphate. An oxidizing decomposition in either the wet or dry way must be used with either limestone or cement to obtain all the sulphur.

The report closes with the following *method suggested by Clifford Richardson, for the analysis of limestone, raw mixture, and Portland cement, proposed for trial by the committee and modified in accordance with the suggestions of W. F. Hillebrand.*

Solution.—One-half gram of the finely powdered substance is to be weighed out, and, if a limestone or unburned mixture, strongly ignited in a platinum crucible over the blast for fifteen minutes. It is then transferred to an evaporating dish, preferably of platinum, for the sake of celerity in evaporation, covered with a watch-glass, and 10 cc. of hydrochloric acid, diluted with about 50 cc. of water, added. Digestion on the water-bath is allowed to go on for about fifteen minutes when the substance should be

Digitized by Google

entirely decomposed.[1] The cover-glass is then removed, washed, and the solution evaporated to dryness, as far as this may be possible on the bath.

Silica.—The residue, without further heating, is treated at first with 5–10 cc. of strong hydrochloric acid, and then with as much water as the dish will comfortably hold. The cover is then replaced and digestion allowed to go on for ten minutes on the bath, after which the solution is filtered and the separated silica washed thoroughly with hot water. The filtrate is again evaporated to dryness, the residue, without further heating, taken up with acid and water and the small amount of silica it contains separated on another filter-paper. The papers containing the residue are transferred wet to a weighed platinum crucible, dried, ignited, first over a Bunsen burner until the carbon of the filter is completely consumed, and finally over the blast for thirty minutes and checked by a further blasting of ten minutes or to constant weight. The silica, if great accuracy is desired, is treated in the crucible with about 10 cc. of hydrofluoric and four drops of sulphuric acid and evaporated over a low flame to complete dryness. The small residue is washed, finally blasted, cooled, and weighed. The difference between this weight and the weight previously obtained gives the amount of silica.[2]

Al_2O_3 and Fe_2O_3.—The filtrate, about 250 cc., from the second evaporation for silica, is made alkaline with ammonia, and boiled to expel excess, or until there is but a faint odor of it, and the precipitated iron and aluminum hydroxides, after settling, are washed once by decantation and slightly on the filter. Setting aside the filtrate, the precipitate is dissolved in hot dilute hydrochloric acid, the solution passing into the beaker in which the precipitation was made. The aluminum and iron are then reprecipitated by ammonia. The second precipitate is collected and washed on the same filter used in the first instance. The filter-paper, with the precipitate, is then placed in a weighed platinum crucible, the paper burned off and the precipitate ignited and finally blasted ten minutes, with care to prevent reduction, cooled and weighed as $Al_2O_3 + Fe_2O_3$.[3]

Fe_2O_3.—The combined iron and aluminum oxides are fused in a platinum crucible at a very low temperature with about 10 grams of acid potassium sulphate, the melt taken up with hot water and 25 cc. of dilute sulphuric acid. The clear solution is then digested on the steam-bath for about ten minutes, and, if accuracy is desired, the small amount of silica is filtered out, weighed, and corrected by hydrofluoric and sulphuric acids. The

[1] If anything remains undecomposed it should be separated, fused with a little sodium carbonate, dissolved, and added to the original solution.

[2] For ordinary control work in the plant laboratory this correction may, perhaps, be neglected; the double evaporation never.

[3] This precipitate contains TiO_2, P_2O_5, MnO.

Digitized by Google

filtrate is reduced by hydrogen sulphide, boiling out the excess afterwards while passing carbon dioxide through the flask, and titrated with permanganate.[1]

CaO.—To the combined filtrate from the precipitate of ferric and aluminum hydroxides a few drops of ammonia are added, and the solution is brought to boiling. To the boiling solution 10 cc. of a saturated solution of ammonium oxalate are added, and the boiling continued until the precipitated calcium oxalate assumes a well-defined granular form. It is allowed to stand for twenty minutes, or until the precipitate has settled, and then filtered. The precipitate and filter are placed wet in a platinum crucible, and the paper burned off over a small flame of a Bunsen burner. It is then ignited, redissolved in hydrochloric acid, and the solution made up to about 100 cc. with water. Ammonia is added in slight excess, and the liquid is boiled. The small amount of aluminum oxide which is separated is filtered out, weighed, and the amount added to that found in the first determination, when great accuracy is desired. The lime is then reprecipitated by ammonium oxalate, allowed to stand until settled, washed,[2] weighed as oxide by ignition and blasting to constant weight, or determined with standard permanganate.[3]

MgO.—The combined filtrates from the calcium precipitates are acidified with hydrochloric acid, and concentrated on the steam-bath to about 150 cc., 30 cc. of a saturated solution of sodium ammonium phosphate are added, and the solution transferred to a beaker and boiled for several minutes. It is then removed from the flame and cooled by placing the beaker in ice-water. After cooling, ammonia is added, drop by drop, with constant stirring until the crystalline ammonium-magnesium orthophosphate begins to form, and then, in slight excess, the stirring is continued for several minutes. It is then set aside for several hours in a cool atmosphere and filtered. The precipitate being redissolved in hot dilute hydrochloric acid, the solution is made up to about 100 cc., 2 cc. of a saturated solution of sodium ammonium phosphate added, and ammonia, drop by drop, with constant stirring until the precipitate is again formed as described. It is then allowed to stand for about two hours, when it is filtered on paper or a Gooch crucible, cooled and weighed as magnesium pyrophosphate.

K_2O and Na_2O.—For the determination of the alkalies, the well-known method of Professor J. Lawrence Smith is to be followed, either with or without the addition of calcium carbonate with the ammonium chloride.

[1] In this way only is the influence of titanium to be avoided, and a correct result obtained for iron.

[2] The volume of wash-water should not be too large, *vide* Hillebrand.

[3] The accuracy of this method admits of criticism, but its convenience and rapidity demand its insertion.

Digitized by Google

SO_3.—One gram of the cement is dissolved in 15 cc. of hydrochloric acid, filtered and the residue washed thoroughly.[1] The solution is made up to 250 cc. in a beaker and boiled. To the boiling solution 10 cc. of a saturated solution of barium chloride are added slowly, drop by drop, from a pipettte and the boiling continued until the precipitate is well-formed. It is then set aside over night, filtered, ignited and weighed as barium sulphate.

Total Sulphur.—One gram of material is weighed out in a large platinum crucible and fused with sodium carbonate and a little potassium nitrate, being careful to avoid contamination from sulphur in the gases from the source of heat. The melt is treated in the crucible with boiling water and the liquid poured into a tall narrow beaker and more hot water added until the mass is all dissolved. The solution is then filtered. The filtrate contained in a No. 4 beaker is to be acidulated with hydrochloric acid and made up to about 250 cc. with distilled water, boiled, the sulphur precipitated as barium sulphate and allowed to stand over night.

Loss on Ignition.—Half a gram of the cement is to be weighed out in a platinum crucible, and blasted fifteen minutes. The loss by weight, which is checked by a second blasting of five minutes, is the loss on ignition. B. S. CUSHMAN.

Modifications of Hempel's Gas Apparatus. BY THEODORE WILLIAM RICHARDS. *Proc. Am. Acad.*, 37, 273; and *Zeit. anorg. Chem.*, 29, 359.—In place of the Hempel absorption pipette the author suggests the use of a bottle provided with a two-hole stopper through one opening of which is inserted a plain bent glass tube, while through the other opening passes the stem of a bulb or wide tube in which the absorption is effected. The upper part of this bulb terminates in a capillary tube, and this is connected with the measuring burette in the manner customary with the Hempel apparatus. The pipette may be used with solid reagents by making the stem of the bulb of wide tubing and inserting in the lower end of this tube a perforated stopper. As a measuring tube the author uses an ordinary 50 cc. burette inverted and provided with a level bulb and water-jacket. Determinations with this apparatus of carbon dioxide in mixtures of that gas with air gave very satisfactory results.

L. M. DENNIS.

METALLURGICAL CHEMISTRY.

Fluctuations of Prices of Metals Since 1890. *Iron Age*, February 13, 1902.—A very clear and interesting diagram showing the monthly quotations of copper, tin, lead, zinc, and tin-plate for twelve years. The high prices of 1899 and 1900 show startlingly on the diagram. J. W. RICHARDS.

[1] Evaporation to dryness is unnecessary, *vide* Hillebrand.

Digitized by Google

Lake Superior Mining Interests. *Iron Age*, February, 13, 1902.—A review of the present condition of the copper and iron mines, and their prospective development. J. W. RICHARDS.

The United States Mineral Export Trade in 1901. *Eng. Min. J.*, February 8, 1902.—The total in 1901 was $188,637,536, a decrease of 18 per cent. from 1900. The causes of this decrease were industrial depression abroad, the troubles in China and South Africa, and the unprecedented home demand. The exports of tin plate, however, increased 50 per cent. Exports of copper decreased 42.5 per cent. ; of manufactured iron and steel, 34 per cent. ; of steel rails, 11 per cent. ; of zinc, 85 per cent. ; of bituminous coal, 14 per cent. Lead exports increased 60 per cent., and anthracite coal, 35 per cent. J. W. RICHARDS.

Opportunities for Improvement in Mica Mining. BY G. W. COLLES. *Eng. Mag.*, February, 1902.—Mica is high-priced, because of the extraordinary proportion of waste between the rough block and the finished product. The cut mica, as it reaches the market, is only 1 to 3 percent. of the mica mined, and not more, as a rule, than one-fiftieth of 1 per cent. of the rock excavated in getting it. The only opportunities for improvement specified by the writer are the use of the power drill where it is not being used, and a judicious expenditure of capital in the mica regions. J. W. RICHARDS.

The Florida Phosphate Trade. *Eng. Min. J.*, February 15, 1902.—Germany imported 39 per cent. of the output in 1901. Seventy-four per cent. of the total 615,000 tons produced was exported. Our domestic factories use the lower grades, the better grades are exported. Pebble phosphate carrying 58 to 75 per cent. of bone phosphate sells at $4.25 to $5 per ton less than high-grade rock at Fernandina. J. W. RICHARDS.

The University of Texas Mineral Survey. BY WM. B. PHILLIPS. *Eng. Min. J.*, February 8, 1902.—A report of progress. It deals with the work of the survey during the past year, and contains a full account of the sulphur deposits in the northeastern part of El Paso County, and also some observations on the quicksilver deposits in the southwestern part of Brewster County. J. W. RICHARDS.

Washing of Bituminous Coal by the Luhrig Process. BY J. V. SCHAEFER. *Iron Age*, February 20, 1902.—From *J. West Soc. Eng.* Slate has a specific gravity of 1.5 to 2, and can be removed by washing ; sulphur as iron pyrites is easily removed when in lumps, but not when in thin flakes attached to the coal ; sulphur as sulphate of lime or magnesia occurs as thin sheets, which can mostly be removed ; organic sulphur cannot be detected by physical inspection and cannot be removed. Fire-clay

Digitized by Google

is apt to form a sticky emulsion, which clogs the machinery. The article describes trough washers, the Campbell bumping table, the Robinson washer, and a variety of jigs. The Luhrig process employs a jig with a plunger, placing on top of the screen a layer of feldspar crushed to a uniform size. The refuse from the coal works its way into the feldspar and gets down to the bottom of the jig. A design of a plant to handle 100 tons per hour is shown. The discussion is interesting.

J. W. RICHARDS.

The Coos Bay Coal Fields. BY C. ROCKWELL. *Eng. Min. J.*, February 15, 1902.—These are on the coast of Oregon in the county of Coos. Coal was discovered there by the first settlers, and shipments have been regularly made since 1855. There is approximately 250 square miles of coal area. The coals are lignites, frequently showing the woody structure. The Newport mine turns out about 200 tons daily. Its seam is 6 feet thick, and is worked by powder, pick, and shovel, no coal-cutting machinery being used. The chemical composition of this coal is: moisture, 9 to 17 per cent.; volatile matter, 41 to 44 per cent.; fixed carbon, 32 to 44 per cent.; ash, 3 to 8 per cent.; sulphur, 1 to $2^1/_2$ per cent. The immense waste heaps take fire spontaneously and burn to a red clinkery cinder, which makes good ballast and road material. This is a typical mine of the region.

J. W. RICHARDS.

Smoke Abatement in St. Louis. BY W. H. BRYAN. *Iron Age*, February 13, 1902. Read before the *Eng. Club of St. Louis.*—A historical review of the general subject of smoke abatement, discussion of the nature of smoke, the nature of smokeless fuels, the loss of heat in smoke. Of smokeless fuels, the writer concludes that powdered coal promises to become the cheapest and most available. The greatest hope for relief is to learn to burn the ordinary fuels smokelessly. Much can be accomplished by careful firing alone; no patent device will work satisfactorily with careless firing. Special devices are divided into five classes: 1. Steam jets, above or below the grate, are reasonably effective, but are not economical of fuel. They should be turned on at the time of firing and turned off in two or three minutes, after the fresh fuel has ignited. 2. Cooking furnaces or fire-brick arches are capable of giving almost perfect results if properly designed and intelligently operated. Best adapted for plants where the service is reasonably uniform. Successful types are the Reynolds and Kent furnaces. 3. Down-draft furnaces have proved very successful and have come into extensive use where excessive demands for overwork are frequently made. The Hawley form has one grate above the other, the fire bars of the upper grate being water tubes connected with the circulating system of the boiler.

Digitized by Google

The gases must pass downward through the bed of fuel. Greater draft is required than for common settings. 4. Automatic stokers, including feed devices and chain grates. These have come into extensive use in large modern plants. Their first cost and repairs are high, but they save materially both labor and fuel. They are not all equally well adapted to all fuels. The matter should be studied out for each case separately. 5. Powdered fuels have been employed successfully in cement kilns and under boilers. The plant necessary is somewhat elaborate, and as the fuel is liable to spontaneous combustion it must be powdered as it is used, and thus cannot be stored or handled in large quantities. Combinations of the above five types are frequently made, as, for instance, the fire-brick arch with mechanical stoker and steam jet. On locomotives and steamboats, brick arches and steam jets have given best results. Oil is used also. No apparatus or device can dispense with intelligent handling. J. W. RICHARDS.

Iowa's Iron Mine. BY S. W. BEYER. *Eng. Min. J.*, February 22, 1902.—The only one developed is Iron Hill, three miles northeast of Waukon, the seat of Allamakee County. This hill is 200 feet high, trends east and west, and has an area of more than half a square mile. The maximum thickness of ore is 135 feet. The ore is siliceo s limonite, concretionary in structure, embedded in an ocherous clay matrix. The sulphur and phosphorus are irregular, but probably, on the average, inside the Bessemer limits; the iron averages 56.7 per cent. The ore is washed, and the chert nodules and like impurities removed by hand. The one plant operating can turn out 300 tons per 10-hour day. Shipping facilities are poor, it costing 50 cents per ton to transport the ore to the railway, three miles distant. The available ore in sight is 12,000,000 tons. J. W. RICHARDS.

Geology of the Mesabi Iron Region. BY C. K. LEITH. *Eng. Min. J.*, February 22, 1902.—Paper read before the Geological Society of Washington. The Mesabi district is the typical pre-Cambrian district of the Lake Superior region. The ores have resulted from the alteration of rocks containing green granules of ferrous silicate. The formations bear evidence of sedimentary origin; and it is believed that the iron, derived from the leaching of the Archean basic rocks, was carried in solution mainly as carbonate, and was thrown down by oxidation and hydration as limonite. This settled, became mingled with organic material, while silica also it precipated, probably through the agency of organisms. This combination produced ferrous silicate, which, when the formation was lifted out of the water, was weathered and concentrated to the present beds. J. W. RICHARDS.

The Smith Mine, Tenn. BY N. W. BUCKHOUT. *Mines and*

Digitized by Google

Minerals. February, 1902.—This is a limonite mine, on the summit of a high and very steep hill, in Lawrence County, Tenn. The ore is in layers and pockets, in a bed six feet in thickness; runs when picked and washed 47 to 48 per cent. of iron, and is high in phosphorus. The output is 8000 to 9500 tons monthly which will shortly be doubled. It is shipped to the furnaces of the Tennessee Coal and Iron R. R. Co. in Sheffield, Ala., and to the Sloss Iron and Steel Co. at Florence, Ala.

J. W. RICHARDS.

Pig Iron Production in 1901. *Eng. Min. J.*, February 8, 1902. —The output was 15,878,354 tons, 85 per cent. of which was produced with bituminous coal and coke, 12.2 per cent. with anthracite and coke, 2.5 per cent. with charcoal, and 0.3 per cent. with charcoal and coke. Of the total, Pennsylvania produced 46.2 per cent.; Ohio, 20.9 per cent.; Illinois, 10.1 per cent.; and Alabama, 7.7 per cent.; or 84.9 per cent. for these four states. Allegheny County, Pennsylvania, produced alone 18.2 per cent. of the whole. J. W. RICHARDS.

Comparative Cost of Operating an Iron Smelting Plant by Gas Engines and by Steam Engines. BY CHATARD, BOTCHFORD AND HOLCOMBE. *Am. Gas Light J.*, February 10, 1902. (Graduation Thesis, Stevens Inst., 1901).—Experiments were made at the Warwick Iron and Steel Co's. furnace, Pottstown, Pa., where steam is used. The practical results arrived at were as follows: The calorific value of the gas per cubic foot is 118 British thermal units, and 646,910 cubic feet are used by the boilers per hour. The efficiency of the boilers is 58.2 per cent., the horse power developed by the engines 1,150. Using the same gas, gas engines could develop 7,634 H. P., leaving a clear excess of 6,000 H. P., above the needs of the furnace. The cost of the gas engine plant for operating the furnace alone would be $82,800, as against $74,750 cost of boilers and engines, while, using gas, by investing $443,480 more, the surplus 6,000 H. P. could be generated. Assuming this to be sold at $20 per H. P. year, the profits would be 13 per cent. on the money invested, allowing 10 per cent. for depreciation. J. W. RICHARDS.

The New York Assay Office. *Sci. Am.*, February 15, 1902.—A historical account accompanied by illustrations. The technical descriptions contain nothing new. J. W. RICHARDS.

The Minnequa Works of the Colorado Fuel and Iron Company. *Age of Steel*, February 8, 1902.—The works are being rapidly extended. They consist of three blast-furnaces of 200, 250 and 400 tons daily output, respectively, and two of 400 tons capacity being built. The 10-ton Bessemer converters are being installed. The rail mill is being increased to 1,200 tons daily

Digitized by Google

capacity. A wire mill is being built, with a daily capacity of 400 tons. The foundry has a daily capacity of 100 tons. A tin plate mill to employ 700 hands is being erected. J. W. RICHARDS.

The Sunrise Iron Mines, Wyoming. BY J. BIRKINBINE. *Iron Age*, February 6, 1902.—The Minnequa Works of the Colorado Fuel and Iron Co., at Pueblo, draws its ore supply from the Fierro mines near Hanover, N. M., the Orient mine in Central Colorado, and the Sunrise mine in southeastern Wyoming. The first furnishes magnetite and red hematite; the second is probably the largest deposit of high-grade Bessemer brown hematite in the country; the latter is an extensive group of red hematite lenses of high quality. Its average composition is 62 per cent. iron, 5 per cent. silica, 1.5 per cent. lime, 0.025 per cent. phosphorus, 5.5 per cent. moisture. The mines are 132 miles north of Cheyenne, at an elevation of 4900 feet. The ore is taken from the side of a hill by steam shovels, and as much as 1000 tons daily has been shipped. J. W. RICHARDS.

The Cambria Steel Company's New Works. *Iron Age*, February 16, 1902.—The new plant is at Franklin, east of Johnstown. It comprises coke ovens, steel works, blooming mill, slabbing mill, structural department, and car works. To these will be added plate mills, bar mills, and blast-furnaces. The coke plant, begun in 1895, comprises 160 Otto-Hoffman ovens. The open-hearth steel plant has two electric charging machines, capable of charging 50 tons in fifteen to twenty minutes. There are seven 50-ton stationary furnaces, six basic and one acid. The ladles will hold 75 tons. The gas plant contains 36 Taylor producers. J. W. RICHARDS.

New Steel Foundry of the Pennsylvania Steel Company. *Iron Age*, January 30, 1902.—Illustrated description of the new steel-castings foundry, 756 feet long by 174 feet wide, of steel construction covered with corrugated iron, lighted by double rows of windows and a system of arc lights, with two 50-ton and three 20-ton traveling cranes, and two 25-ton hoists. The plant will have three 20-ton open-hearth furnaces, and one 10-ton, of the Campbell tilting type. All the mechanism around the furnaces is run by electric motors. The total capacity will be 250 tons of steel per day, and castings up to 60,000 pounds will be made. The castings are trimmed by pneumatic chippers and cleaned by the sand-blast. J. W. RICHARDS.

Metallography in Car Wheel Manufacture. BY A. W. WHITNEY. *Iron Age*, February 20, 1902.—The steel industry was the first to apply to chemistry, and is now first in metallography; founders are just beginning to realize its advantages. A sample can be prepared for inspection in ten to twenty minutes.

Digitized by Google

Photomicrographs are easily made, but give no idea of the vividness of the actually observed samples. There are given views of six different cast irons, with descriptions; five are at 750 diameters magnification. J. W. RICHARDS.

A New Iron Pigment. BY DR. A. S. RAMAGE. *Iron Age*, February 6, 1902. From *Elec. World and Eng.*—Waste ferrous sulphate liquor is neutralized, then air blown through it to form hydrated basic ferric oxide, $Fe_2O_3.Fe(OH)_6$, and the sulphuric acid thus formed is neutralized *pari passu* by the addition of sodium carbonate, to prevent it redissolving the precipitate. The pigment is light yellow, may be converted by heat into iron oxide reds, and has an absorptive capacity for oil $2^1/_2$ times as great as French ochre and $7^1/_2$ times that of white lead. Its covering power is also proportionately high. J. W. RICHARDS.

Improvements at the Granby Smelters, British Columbia. *Eng. Min. J.*, February 8, 1902.—The latest addition is a copper matte converting plant, comprising a steel building 160 by 68 feet containing two horizontal barrel-type converters, 72 inches in diameter by 100 inches long. A 40-ton traveling electric crane handles the shells and matte, while a 10-ton traveler brings the molten matte from the furnace building. The blast-pressure is ten pounds per square inch. After sufficient slag is formed it is removed, after which the pure matte is converted into blister copper. The slag is granulated. Each set of converters has a capacity of 50 to 70 tons of matte daily. J. W. RICHARDS.

Lake Superior Copper. BY H. J. STEVENS. *Mines and Minerals*, February, 1902.—A review of the condition of the various copper mines in that district. Several new concentration plants and one reduction plant are being constructed, and the prospects are for greatly increased production next year.
J. W. RICHARDS.

Ancient Copper Smelting in Mexico. BY C. W. PRITCHETT. *Eng. Min. J.*, February 15, 1902.—Description of a plant used in the southern part of the state of Michoachan. The ore was chalcopyrite; only the richest portions were mined. It was hand-sorted, the fines concentrated in a trough, hewn out of a tree trunk; it took 11 washings to get clean ore. The smelting plant consisted of a roasting furnace and a smelting furnace. The former had six stalls, 4 feet high by 3 feet in diameter, the fronts being open. The charge is roasted with pine kindling and charcoal, and is drawn and recharged 5 or 6 times. The smelting furnace is a hole in the ground, $2^1/_2$ feet in diameter and 18 inches deep, with two round bellows, having tuyères leading into it, with noses made of clay. The ore is charged with successive layers of charcoal and topped with fines. It is blown continuously till

Digitized by Google

melted down to slag and matte. The matte is returned to the roasting furnaces, roasted several times, and then returned to the smelter, recharged as before, with the richest slags, and reduced to copper, which collects in the bottom as the segment of a sphere 10 inches across and 5 inches thick. If this bends on the edge when hammered, without breaking, it goes at once to the kettle maker. The ingots are called planchas. The average copper in the ore is 36 per cent., and the plant treated 30,000 pounds a month. The smelting charge was $3 per *carga* of 300 lbs., and the profits about $1 per *carga*. J. W. RICHARDS.

The Charlier Oil Melting Brass Furnace. *Iron Age*, February 13, 1902.—Consists of a cylindrical iron casing lined with fire-brick, set on axial trunnions, turned by a hand wheel, fed at one end by an oil air burner, the products of combustion passing out through a hopper into which the brass to be melted is dropped. With oil at 4 cents per gallon, the cost is 16 cents per hour; natural gas can be used. The furnace melts 600 lbs. of copper-tin bronze ingots in one hour, 600 lbs. of turnings in two hours. Nine heats of one hour each can be run off per day; furnaces are made up to 4000 lbs. capacity. The J. W. Paxson Co., of Philadelphia, are the makers. J. W. RICHARDS.

Lead Smelting in Southeast Missouri. BY R. B. BRINSMADE. *Mines and Minerals*, February, 1902.—The ores smelted are galena concentrates running 60 to 70 per cent. of lead, the balance limestone and pyrites, in one-third inch lumps down to table slimes. At Desloge, five reverberatory furnaces are operated, working each 2 tons of galena per eight hours' shift, by the roasting and reaction process. The Federal Lead Co., at St. Louis, uses Scotch hearths with American water-back, each with a basin 30 by 22 inches and 15 inches deep; with four 1-inch tuyères in the water-back, and 6 to 8 ounces of blast, in which two men put through 4,000 lbs. of concentrates in eight hours. Only 60 per cent. of the lead present is thus extracted, the residues being sent to the blast-furnace. The hearth gases are cooled in long flues and then filtered through cotton bags. The St. Joe smelter at Bonne Terre consists of a roasting plant, blast-furnaces and refinery. The roasters are hand reverberatories with roasting hearth 40 by 11 feet, and slagging hearth 11 by 11 feet. The slagging hearth is made by fusing iron pyrites to the depth of 1 foot. The ore stays in the furnace thirty hours. It is mixed with 15 per cent. of sand, and 5 tons are worked in twenty-four hours by two men in a shift. The sulphur is reduced to about 4 per cent. The blast-furnace plant at Herculaneum contains three 54-inch round water-jacket furnaces, and one rectangular, 54 by 80 inches; their total capacity is 230 tons daily. The slag runs about 40 per cent. FeO; 30 per cent. SiO_2; 12 to 14 per cent. CaO. The

Digitized by Google

matte produced is roasted in a Pearce turret roaster. The refinery has peculiar liquating furnaces, the beds of which are two cast-iron plates 3 feet wide by 5 feet long meeting in a right-angled V, with holes at intervals in the bottom, through which the liquated lead runs into a trough beneath. The merchant kettles hold 30 tons, which is refined in ninety minutes by steam from a 1-inch pipe. The pots are emptied by a Steitz siphon, casting into moulds on the periphery of a moulding machine. The refined lead contains $1^1/_2$ ounces of silver per ton. The writer considers that the Silesian reverberatory is the best plant, where its first cost must be small, as the labor cost and fume loss are moderate. The blast-furnace plant is expensive on account of the roasters required, but the fume loss is less. The Scotch hearth is the cheapest in first cost, but the excessive fumes render it practicable only in connection with a bag-house, and the poor extraction renders a blast-furnace necessary to treat the residues. This combination appears the best for a large plant.

J. W. RICHARDS.

Dredging for Fine Gold in Idaho. BY R. BELL. *Eng. Min. J.*, February 15, 1902.—The Snake river placer beds have been worked successfully since 1894. The Sweetzer-Borroughs Mining Company has two dredges, handling 2,500 and 2,000 cubic yards of gravel daily, at a working cost of $4^1/_2$ and $5^1/_2$ cents per cubic yard, respectively. The average values are about 10 cents, although 20 cents is frequently found per cubic yard, and the dredges are earning good profits. The pumps suck the sand and discharge it through shaking screens into a distributing box, whence it passes to 16 inclined burlap tables, with an aggregate surface of 1,000 square feet, which discharge over the side of the boat. The burlaps are taken up and washed in a wooden tank every six to eight hours, and the gold concentrates then amalgamated and retorted.

J. W. RICHARDS.

The Commercial Importance of Aluminum. BY E. WILSON. *Elec. Rev.*, January 25 and February 8, 1902.—Paper read before British A. A. S.: In 1900, 5,000 tons were produced by 25,000 H. P., the capital invested being $10,000,000. No new process of manufacture has been devised since 1890. In the Herault furnace, a current density of 700 amperes per square foot of cathode is used, and the working temperature is 750° to 850° C. The yield is stated to be one pound of metal per electrical H. P. hour. (It should read "per 20 electrical H. P. hours.") The specific electrical resistance of metal containing 0.31 per cent. iron and 0.14 per cent. silicon is 2.6×10^{-6} legal ohms at 0° C., and 2.76×10^{-6} legal ohms at 15° C.

For electric transmission lines, the use of aluminum conductors is increasing. To be of the same conductivity, an aluminum

Digitized by Google

wire must have 1.27 times the diameter of the copper wire which it replaces. The increased radius, for the same conductivity as copper, helps to reduce the "electric glow discharge" in wires carrying very high potentials. Larger spans and, therefore, fewer poles can be used, on account of the greater strength of the aluminum wire. The joints are made mechanically, although welded joints have been made and found satisfactory. Aluminum is in general use in iron and steel foundries as an addition to help produce fluid metal and sound castings. Its action in this direction is twenty times more powerful than silicon. Rolled sheet aluminum, 0.001 inch thick, has replaced leaf silver for decorative purposes. J. W. RICHARDS.

Aluminum Silver. BY ERWIN S. SPERRY. *Al. World*, February, 1902.—German silver is a refractory and peculiar alloy, running sluggishly and making castings full of pin-holes. By adding to it a small quantity of aluminum the nature of the alloy seems to be transformed; it fills the mould completely and there is an entire absence of blow-holes. Less than 0.05 per cent. of aluminum will effect this change. Adding larger amounts, such as 3 to 3.5 per cent., the alloy is the nearest approach to tempered steel of all the non-corrosive alloys—hard and stiff, but can be worked and machined. As the best formula for this hard alloy, the writer gives—copper 57, nickel 20, zinc 20, aluminum 3 to 3.5, according to the stiffness required. The nickel and copper are put into the crucible together and covered with charcoal; when melted together the aluminum is added. Much heat is evolved as the latter alloys. After stirring with a plumbago stirrer the pot is allowed to cool, or cooled off by adding return metal, and then the zinc added, stirred well, and the metal poured at once. The physical properties of this alloy will be given in a subsequent paper. J. W. RICHARDS.

ORGANIC CHEMISTRY.

The Action of Liquid Ammonia on Acid Chlorides and Esters. BY EDWARD BARTOW AND DAVID F. MCFARLAND. *Kansas Univ. Quart.*, July, 1901, pp. 79–85 (Series A).—The authors conducted the following series of experiments to ascertain whether acid amides could be obtained by the action of liquid ammonia upon acid chlorides and esters, and to determine the conditions governing such reactions. *The action of liquid ammonia on acid chlorides.*—It was found best to cool the acid chloride to the temperature of the liquid ammonia and then gradually add the latter in considerable excess. In this way the amides of the three chloracetic acids, of benzoic and of sulphuric acid were obtained. Attempts to prepare acetamide resulted unsatisfactorily. Bromacetyl chloride yielded a *white mass*, which did not melt at 200°.

Digitized by Google

The chief drawback to the method consists in the difficulty of freeing the amide from the ammonium chloride. *The action of liquid ammonia on esters.*—The reaction between liquid ammonia and esters is not nearly so violent as in the case of the acid chlorides. In all, 42 esters were treated; 9 yielded the amide, 2 gave compounds with higher melting-points, 7 appeared to give decomposition products, and the remainder were not acted upon. The esters of the three chloracetic acids gave quantitative yields of the amide. Amides were also obtained from the esters of dibromacetic, cyanacetic, chlorpropionic, pelargonic, oxalic, and tartaric acids. From monobromacetic ester *white cubical crystals* were obtained, not melting at 200°, subliming at higher temperatures, turning red when heated or upon standing, and which were possibly a mixture of ammonium bromide and glycinamide. Tribromacetic ester yielded white *crystals*, m. p. 45°, whose nature has not yet been ascertained. The compound obtained from cyanacetic ester melted at 118°, corresponding to the melting-point assigned the amide by Henry, but differing from that given by Hoff. The amide obtained from chlorpropionic ester melted at 72°, while its melting-point is given by Beckurts-Otto as 80°. From benzoyl acetic ethyl ester a small amount of a substance was obtained melting at 167°, and apparently not identical with benzoylacetamide (m. p. 113°). The tartramide produced showed a melting-point of 166°. No amides could be obtained from the ethyl esters of the following acids : formic, acetic, propionic, butyric, valeric, caprylic, phenylacetic, malonic, succinic, lactic, levulinic, citric, benzoic, salicylic, orthoformic and carbonic. *The action of esters at higher temperatures.*—These reactions were carried out by sealing up the esters and liquid ammonia in strong glass tubes and warming carefully for twelve hours at the room temperature and at 60°–70°. In this way malonamide was produced, but in no other case did the higher temperature prove of any advantage. M. T. BOGERT.

Dichloracetyl Phosphide. BY P. N. EVANS AND C. E. VANDERKLEED. *Am. Chem. J.*, 27, 142–146.—Dichloracetic acid was prepared from chloral hydrate and potassium ferrocyanide, and the acid then changed to the chloride by the action of phosphorus trichloride. By passing hydrogen phosphide into this chloride the *dichloracetyl phosphide* was obtained as a yellowish-white crystalline powder, charring at 200° without melting, nearly or quite insoluble in ether, benzene, chloroform, and petroleum ether; insoluble in cold water, but soon decomposed by it with evolution of hydrogen phosphide, and very soluble in strong alcohol. M. T. BOGERT.

Contribution to our Knowledge of Substitution Processes in the Fatty Series. BY ARTHUR MICHAEL. *Ber. d. chem. Ges.*,

Digitized by Google

34, 4028–4058.—According to a conception of Kekulé's, the first stage of every chemical transformation consists in a mutual attraction of the reacting molecules in such fashion that they coalesce to double molecules, which then, by compensation of the atomic chemical affinities, break into at least two molecules. The author regards this as the true explanation of all chemical changes. The widely accepted hypothesis that in substitution a direct exchange of atoms occurs is challenged on the ground that it is both out of harmony with the facts and is also in direct opposition to our ideas of the distribution of the chemical forces among themselves. In support of this position numerous examples are cited. *The action of bromine upon hexane* (with W. W. Garner). In the preparation of hexane from propyl iodide and sodium, the addition of a few drops of acetonitrile was found to assist the reaction greatly. By the action of bromine upon hexane, according to the method of Schorlemmer, mainly 2-bromhexane, together with small amounts of 1- and 3-bromhexanes, resulted. Some hexylene was also produced. *The behavior of the monobrom acids of the third and fourth fatty series and of their ethyl esters toward heat* (with W. H. Graves). By the action of bromine upon butyric acid only the α-brom acid was obtained. The ethyl ester of α-brombutyric acid boils at 177.5° at 764.6 mm. and is not changed by long boiling or by fractional distillation, contrary to the conclusion of Erlenmeyer and Marx. By boiling the repeatedly distilled α-brom ester for an hour and a half with baryta water, the amount of crotonic acid produced indicated a conversion of only 1.5 per cent. of the ester to the isomeric β-ester. When the α-brom acid was heated for 26 hours at 120° in a sealed tube only 7 per cent. was changed to the β-acid. The statement of Hell and Lauber that α-brombutyric ester is changed mainly to crotonic acid by the action of alcoholic sodium hydroxide is incorrect. Bromination of isobutyric acid, by the Hell-Volhard method, yielded α-brom isobutyric acid, m. p. 48°–49°, which suffered no rearrangement when heated for 10 hours at 100° in a sealed tube. By the action of baryta water upon it, 20.9 per cent. of the theoretical yield of methacrylic acid was obtained while Fittig and Engelhorn report a yield of 40.8 per cent. α-Bromisobutyric ethyl ester boils at 161.5° at 753 mm. and is very slightly rearranged to the β-ester by continued heating. Pure α-brompropionic, b. p. 95°–96° at 10 mm., by very long heating at 120°–130°, yields a small amount of the β-brom acid. At higher temperatures, the β-brom acid tends to decompose into hydrobromic and acrylic acids, the latter polymerizing to polyacrylic acids. Normal α-bromvalerianic ethyl ester, b. p. 92°–94° at 23 mm., 194.5° at ordinary pressure, is likewise but very slightly changed to the β-brom derivative by the action of heat. *The action of chlorine and bromine upon the chlorides of mono-*

Digitized by Google

basic fatty acids (with W. W. Garner). The chlorination was generally carried out in direct sunlight, using a 6–10 per cent. titrated carbon tetrachloride solution of chlorine. The separation of the chlorinated acid chlorides can be accomplished much more readily than in the case of the chlorinated acids, the reaction takes place with much greater ease, and the products may be repeatedly distilled *in vacuo* without decomposition. By the action of chlorine upon propionyl chloride the β-chlorpropionyl chloride, b. p. 82°–82.5° (corr.) at 102 mm., results, together with a small amount of the α-chlor compound. The chlorination of propionic acid itself yields a mixture of the monochlor acids, of which at least 65 per cent. is the β-acid. Pure α-chlorpropionic acid boils at 83.5°–84.5° (corr.) at 12 mm. By the action of potassium hydroxide, about 13.3 per cent. of it is converted to acrylic acid, while the corresponding α-brom acid, when similarly treated, yields only traces of acrylic acid. The action of chlorine upon butyryl chloride, in carbon tetrachloride solution, gives a mixture of monochlorbutyryl chlorides in about the proportion of 60 per cent. β (b. p. 67°–69° at 41 mm.), 20 per cent. α (b. p. 128°–130°), and 20 per cent. γ (b. p. 173°–174°), together with a small amount of αγ-dichlorbutyryl chloride (b. p. 98°–100° at 42mm.). ***β-chlorbutyranilide***, prepared from the chloride, crystallizes in thin leaflets, m. p. 89°–90°, and is easily soluble in alcohol or ether, but difficultly soluble in water. α-Chlorbutyric acid, heated with baryta water, yields α-hydroxybutyric and a small amount of crotonic acid (m. p. 72°). Chlorine readily attacks isobutyryl chloride, giving about 30–40 per cent. of the β-derivative (b. p. 171°–172° at 765 mm.), 60–70 per cent. of the α-derivative (b. p. 126°–127°), and a small amount of the trichlor compound. ***α-Chlorisobutyranilide*** forms thin colorless leaflets, m. p. 69°–70°, soluble in alcohol or ether, insoluble in cold water. ***β-Chlorisobutyranilide***, thin leaflets, m. p. 104°–105°, is easily soluble in alcohol or ether, and but slightly soluble in hot water. In the sun, isovaleryl chloride is readily attacked by chlorine, giving the β- and α-chlor derivatives, the former boiling at 104°–104.5° at 70 mm., the latter at 152°–153° (corr.) at 758 mm. Possibly some γ-chlor and dichlor derivatives are formed also. By the action of bromine upon butyryl chloride, the α-brom chloride is the chief product (b. p. 154° at 770 mm.), the amount of β-brom compound produced being only about 15 per cent. as much. At the same time there is produced a substance which forms beautiful bright red crystals, m. p. 40°–42°, very unstable, rapidly decomposing in the air or with moisture, and which appears to be a compound in which the chlorine of the chloride has been almost wholly displaced by bromine. M. T. BOGERT.

Contribution to our Knowledge of the Addition-Splitting-

Digitized by Google

Off Law. By Arthur Michael. *Ber. d. chem. Ges.*, 34, 4215–4226.—The author expresses this law as follows: "Whenever, in the addition of elements to an unsaturated organic compound, the formation of two isomeric or stereomeric products is theoretically possible, that one of the two forms which in the addition is the sole or major product is likewise the one most readily reconverted to the mother-substance by splitting off these elements again." "By comparing the addition products of homologous unsaturated compounds it will be seen that the added elements are more easily split out of the product which is the more readily formed by addition, it being understood that the carbon atoms participating in the addition are in direct union only with carbon and hydrogen." This law applies not only to structural but also to stereochemical relations. The main product of the addition of hydriodic acid to propylene is the isopropyl iodide, which is also the one most readily split into these substances again. Isobutylene takes up hydriodic acid more easily than propylene, the resultant iodide losing HI again more readily than isopropyl iodide. By the addition of hydrochloric acid to acetylene dicarbonic acid, chlorfumaric acid is obtained, from which hydrochloric acid is removed with much less difficulty than from chlormaleic acid. Similar relations prevail in the case of the bromcinnamic acids, and with the products of the addition of bromine to acetylene dicarbonic acid. By the addition of bromine to tetrolic acid the same law appears, the bibromcrotonic acid obtained in the larger amount being the one more readily debrominated. As this law seems to prevail, without exception, in all cases of stereochemical reactions so far examined, irrespective of the stability of the chief product and of the nature of the elements added, it offers a means of determining whether the products obtained in such reactions are the first products of the reaction or the result of subsequent rearrangement of an unstable substance to a more stable one. In the case of reactions involving only structural considerations, and in which the added molecule separates into negative constituents, the same rule prevails, the added elements being removed with greater ease the more readily the addition occurs. *Experimental Part* (with T. H. Mighill). *Debromination experiments with ethylene-, propylene-, and isobutylenebromides.* The debromination was accomplished by the action of zinc upon a moist ethereal solution of equal molecules of the bromides. The results of nine experiments are tabulated, showing that the ease of debromination increases quite rapidly from ethylene to isobutylene bromide. *Debromination experiments with bibromsuccinic and bibrompyrotartaric ethyl esters.* The esters of bibromsuccinic, isobibromsuccinic, citra-, and mesabibrompyrotartaric acids, when subjected to the debrominating action of zinc, give results indicating that the bromine is more readily removed from the bibrom-

Digitized by Google

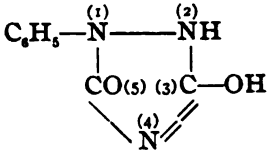
pyrotartaric acids than from the bibromsuccinic. *The addition of bromine to tetrolic acid.* According to Pinner's experiments, the addition of bromine to tetrolic acid in aqueous or chloroform solution yields, in the dark, a bibromcrotonic acid melting at 94°, in the sunlight a bibromcrotonic acid melting at 120°, while in diffused daylight the product is a mixture. Since he found that the lower melting acid is converted by the action of hydrobromic acid into the higher melting isomer, Pinner assumed that the former was the first product of the addition. The author repeated Pinner's work, using the lead salts as a means of separating the two acids. By the addition of bromine to tetrolic acid in aqueous solution in the dark, there was obtained 52–55 per cent. of the acid melting at 94°, 15–20 per cent. of a solid melting at 40°–84°, a substance of penetrating acrolein-like odor, and hydrobromic acid. In the sunlight, the reaction is rapid with larger amounts of by-products, and with the formation of both bibromcrotonic acids. By the action, for two days, in the dark, of hydrobromic acid upon a chloroform solution of the bibrom acid melting at 94°, over 50 per cent. was converted to the isomeric acid melting at 120°. An examination of the mixture obtained by the addition of hydrobromic acid to tetrolic acid in chloroform solution, in the dark, showed the presence of 60 per cent. bibromcrotonic acid, m. p. 120°. In the sunlight, the addition of bromine to a chloroform solution of tetrolic acid takes place very rapidly, the product being a mixture in which the amount of the higher melting isomer (m. p. 120°) is about the same as when the reaction is carried out in the dark. *The debromination of the stereomeric αβ-bibromcrotonic methyl esters.*—The methyl esters of these stereomeric acids were prepared by the action of methyl iodide upon the silver salts. They are both colorless liquids; the methyl ester of the acid melting at 94° has a b. p. of 94° at 11 mm.; that of the higher melting acid (m. p. 120°) boils at 102°–104° at 14 mm. By the action of zinc, the ester of the lower melting acid is debrominated the more easily, from which the author concludes that this acid must be the chief product of the addition of bromine to tetrolic acid. *The splitting off of halogen acid from the β-bromcinnamic acids.*—By the addition of hydrobromic acid to phenylpropiolic acid, two β-bromcinnamic acids are formed, melting at 159° and 134°, respectively. As the higher melting acid is the one produced in the larger amount, it must be the one which will lose hydrobromic acid the more readily when subjected to the action of alkali, and this assumption is fully corroborated by the experiments.

M. T. BOGERT.

The Constitution of Phenylurazole (I). BY S. F. ACREE. *Am. Chem. J.*, **27**, 118–134; *Ber. d. chem. Ges.*, **35**, 553–562.—

Digitized by Google

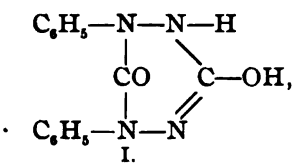
Of the five formulas possible for phenylurazole, the author decides in favor of this one :



which he calls 1-phenyl-2-hydro-3-hydroxy-5-oxyurazole. In support of this formula, the following facts are cited : 1. Phenylurazole is a monobasic acid and gives only a monosilver salt. Although a disodium salt can be prepared, when this is dissolved in water it gives a strong alkaline reaction, indicating that one of the sodium atoms is in union with nitrogen. 2. Since it gives a violet color with ferric chloride in alcoholic solution, it probably contains a —C(OH) = N— enolic group. 3. The silver salt when treated with ethyl iodide gives a 3-ethoxy derivative insoluble in alkalies. 4. When the sodium or silver salt is treated with methyl iodide and alcohol at 100°, an *n*-methyl derivative, melting at 183°–185°, is formed which is doubtless identical with the compound obtained by Busch and Heinrichs (*Ber. d. chem. Ges.*, 33, 455) and regarded by them as a urazine derivative. The isomeric 4-methyl derivative, prepared by a method which could not yield a 2-methyl derivative, melts at 225°. 5. Two series of acyl derivatives may be obtained : N acyls, of amidic character, and O acyls of the nature of acid anhydrides. By the action of acetyl chloride upon the silver salt, the O acetyl derivative is obtained, while acetic anhydride converts phenylurazole into the N acetyl derivative. By the action of hot water upon the 2,3-diacetyl derivative, only the O acetyl group is split off. *Experimental Part.*—Phenylsemicarbazide when boiled with chlorcarbonic ether in acetic ether solution yields *dicarbethoxyphenylsemicarbazide*, which melt at 154° or 172°, the difference in melting-points being due possibly to a keto and enol tautomerism. When this dicarbethoxy compound is heated with alkalies it gives phenylurazole, which melts with decomposition at 264°, and is difficultly soluble in cold water or ether, readily soluble in hot alcohol. With an alcoholic solution of ferric chloride it gives a dirty violet color. It is a strong monobasic acid. The *silver salt* is very stable towards light, easily soluble in ammonium hydroxide, insoluble in dilute nitric acid, and melts with decomposition at 252°. The *barium salt* crystallizes in plates which carry 2 molecules of water of crystallization. It decomposes at 280°–300° without charring. *1-Phenyl-2-methyl-3-hydroxyurazole*, prepared from the phenylurazole by the action of alcoholic potassium hydroxide and methyl iodide, forms fine needles, m. p. 183°, which are readily soluble in alkalies, ether or alcohol, and some-

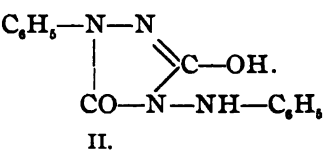
Digitized by Google

what soluble in cold water. It may also be prepared by boiling the silver salt with alcoholic methyl iodide. It is unchanged by evaporation with concentrated hydrochloric acid, and is itself a monobasic acid. Its *silver salt* melts with decomposition at 250°, and is very soluble in ammonium hydroxide, but insoluble in dilute nitric acid. *1-Phenyl-4-methylurazole* was prepared by heating phenylsemicarbazide with methylacetylurea for two hours at 200°. Its m. p. is 225°. With alcoholic ferric chloride solution, a violet color is obtained. It is unchanged by evaporation with concentrated hydrochloric acid. The *silver salt* melts with decomposition at 225°. *1-Phenyl-2-hydro-3-ethoxyurazole* was obtained by the action of ethyl iodide upon the silver salt of phenylurazole. It melts at about 141°, is easily soluble in ether, benzene or alcohol, slightly soluble in ligroin, insoluble in water or alkalies, not even going into solution when boiled with concentrated potassium hydroxide. By evaporation with alcoholic hydrochloric acid, the ethoxy group is saponified with production of phenylurazole again. Further methylation at 2 could not be accomplished by the action of alcoholic potassium hydroxide and methyl iodide. *1-Phenyl-2-hydro-3-oxyacetylurazole* was prepared by the action of acetyl chloride upon the silver salt of phenylurazole suspended in cold benzene. It forms an unstable oil, which yields phenylurazole again even when its aqueous solution is evaporated in a desiccator. *1-Phenyl-2-acetyl-3-hydroxyurazole* melts at 175°, while the *1-phenyl-2-acetyl-3-oxyacetylurazole* melts at 164°. By boiling 3-oxyacetyl-5-styryltriazole-1-propionic acid or ethyl 3-oxyacetyl-5-phenyltriazole-1-propionate with 50 per cent. alcohol, the acetyl group is split off and the corresponding 3-hydroxy-5-styryltriazole-1-propionic acid (m. p. 243°) and ethyl 3-hydroxy-5-phenyltriazole-1-propionate (m. p. 168°) are obtained. *Diphenylurazine.*—The constitution of diphenylurazine is also under investigation by the author. The formula assigned by Pinner is regarded as improbable, since the compound is not a bibasic but a monobasic acid and gives a violet color with ferric chloride. Pinner's statement that it is changed by boiling with alkalies is not correct. The following formulas are suggested, with the preference given to the first one:



I.

or



II.

The *silver salt* is amorphous, fairly stable to light, darkens at 188° and decomposes at 204°. M. T. BOGERT.

On the Formation, Decomposition, and Germicidal Action of

Digitized by Google

Benzoylacetyl and Diacetyl Peroxides. By PAUL C. FREER AND FREDERICK G. NOVY. *Am. Chem. J.*, **27**, 161–192.—By agitating a mixture of benzaldehyde and acetic anhydride in a freezing medium with a current of dry air, benzylidene diacetate is produced, the yield being nearly quantitative, while at 13°–14° practically no diacetate is obtained. The presence of large amounts of acetic acid appears to retard the action, an observation in opposition to Nef's explanation of the production of the diacetate. On the other hand, the presence of metals was found to accelerate greatly the production of the diacetate. If the acetic anhydride be freed very carefully from all acetic acid, the reaction with benzaldehyde proceeds very slowly, acetic acid in small amount apparently acting as a catalyzing agent. The authors conclude that the production of the diacetate is a case of simple addition of acetic anhydride to benzaldehyde or to its desmotropic enol form, and suggest that most reactions of aldehydes of this type may be explained by assuming that it is really the enol form which takes part in the reaction, the keto form constantly changing to enol to maintain the equilibrium, and catalyzers only affecting this rate of change. By passing air through a mixture of benzaldehyde and acetic anhydride free from acetic acid benzoylacetyl peroxide and benzoylacetyl oxide result, with but little benzylidene diacetate. The percentage of peroxide present can be determined by heating the mixture and measuring the gas evolved, the peroxide breaking up into CO_2, CH_4, and a liquid mixture of complex nature, in which benzoic acid can be detected. By a series of experiments, the authors show that the rate of formation of the peroxide is dependent upon the surface action of the substance coming in contact with air and the mixture of benzaldehyde and acetic anhydride at the same time, the presence of metals, filter-paper, etc., greatly accelerating this action, metallic magnesium having the greatest effect. Moisture is not necessary for the reaction, as the authors show, in a carefully conducted experiment in which magnesium is used as the catalyzer. Although sufficient acetic acid is produced in these reactions to dissolve all the magnesium, yet it does not appear to be attacked. The fact that water is not necessary in the reaction disproves Nef's explanation of the formation of benzoylacetyl peroxide. Nef's assumption that benzoyl acetyloxide is an intermediate product is likewise at variance with the results of the authors' experiments. The latter explain the reaction by supposing an equilibrium to exist between the keto and enol forms of benzaldehyde; the latter then adds oxygen to form benzoperacid, which reacts with acetic anhydride to yield benzoylacetyl peroxide: $C_6H_5C(OH){:} + O_2 = C_6H_5C(OH)O_2 = C_6H_5CO.O.OH$, which combines with acetic anhydride to $C_6H_5CO.O.O.COCH_3 + CH_3COOH$. Benzoyl peroxide is only a secondary product of the

Digitized by Google

reaction, as acetic anhydride does not convert it into benzoylacetyl peroxide, nor can benzylidene diacetate be oxidized to a peroxide either by the action of air or of hydrogen dioxide. In the production of the peroxide the extent of liquid surface is not of influence, nor is the oxidation referable in any great measure to a partial dissociation of the oxygen of the air, as is supposed by van't Hoff. The authors believe, however, that the increased activity of occluded oxygen may be due to a partial dissociation of the oxygen molecules, O : O into —O—O—. This view possesses importance from a biological standpoint, as, for example, the ease with which hemoglobin is changed to oxyhemoglobin may be referred to the large surface of tissue exposed. The difference in the oxidizing action of various surfaces is due to their effect upon the rate of change of keto to enol forms. Benzoylacetyl peroxide melts at 40°–41°, and it is stable only when perfectly pure. It is not an oxidizing substance nor has it any odor. In aqueous solution, however, it has a decided oxidizing power. This is due to a hydrolysis, which takes place in two directions, resulting in the formation of benzoperacid and acetic acid on the one hand, and acetoperacid and benzoic acid on the other. Benzoperacid then acts upon the unchanged benzoylacetyl peroxide, with formation of benzoyl peroxide and acetoperacid. The chemically and bacteriologically active constituent of such a hydrolyzed solution is, therefore, acetoperacid, alone or associated with small amounts of benzoperacid. The solubility of the benzoyl acetyl peroxide in water at 25° amounts to 0.639 gram per liter, representing 0.0568 gram active oxygen per liter, which is only one-eightieth the amount of active oxygen contained in a 1 per cent. hydrogen dioxide solution, and yet it possesses a far greater germicidal action. It is suggested that there may be a difference between hydroperoxide and the organic peroxides which are germicides, and also that hypochlorous acid may be really a peroxide—HCl.O.O.ClH. Aniline acts upon the absolute ether solution of benzoylacetyl peroxide to produce acetanilide, benzoic acid, aniline benzoate, azoxybenzene, benzoyl hydrogen peroxide, and benzoyl peroxide, together with traces of benzoperacid. Sodium ethylate yields benzoperacid but apparently no acetoperacid. *Acetyl peroxide* is best prepared by the interaction of barium dioxide, acetic anhydride and hydrochloric acid at low temperatures. By the action of sodium upon its absolute ether solution, a very explosive salt is obtained, which seems to be the sodium salt of acetoperacid. Unlike benzoyl acetyl peroxide, acetyl peroxide, on standing with water, gradually gives off oxygen. *Germicidal action.*—Of the peroxides described, those which are chemically inert are also germicidally inactive, and *vice versa*. Acetyl and benzoylacetyl peroxides are themselves chemically and biologically inert, but they readily

Digitized by Google

undergo hydrolysis with the production of aceto- and benzoperacids, which are strong oxidizing agents of several hundred times the germicidal power of hydrogen peroxide, although the amount of active oxygen is the same as in the latter substance, the difference probably being due to the behavior of the acid ions. The results of the action of these peroxides upon various bacteria and spores are tabulated, showing clearly that while the symmetrical organic peroxides are inert, the asymmetrical peracids easily rank among the most powerful germicides known. M. T. BOGERT.

On Benzoylbenzylurea, Benzoylparatolylurea, and the Corresponding Pseudoethylureas: A Correction. BY HENRY L. WHEELER AND TREAT B. JOHNSON. *Am. Chem. J.*, **27**, 218–219.—In a previous article by the authors (*Am. Chem. J.*, **24**, 208–209 (1900)) the products obtained by the action of benzylamine and paratoluidine upon ethyl benzoylthioncarbamate were reported as normal ureas. It is now found that they are not normal but pseudo ureas. Benzoylpseudoethylparatolylurea, prepared from ethyl benzoylimidothiocarbonate, melts sharply at 75°. By the action of dilute hydrochloric acid, it is changed to benzoylparatolylurea (m. p. 222°–223°) with evolution of ethyl chloride. The substance melting at 89°, formerly described as benzoylbenzylurea, is really benzoylpseudoethylbenzylurea, and when treated with dilute hydrochloric acid also evolves ethyl chloride with production of the true benzoylbenzylurea, m. p. 165°–166°. These amines, therefore, like ammonia, react on ethyl benzoylthioncarbamate with evolution of hydrogen sulphide and formation of pseudoureas as follows: $C_6H_5CONHCSOC_2H_5 + RNH_2 = C_6H_5CONH(SH)C(NHR)OC_2H_5 = C_6H_5CON:C(NHR)OC_2H_5$. *Benzoylpseudoethylparatolylurea*, small, colorless, flat prisms, from alcohol, m. p. 75°. *Benzoylpseudoethylbenzylurea*, small, colorless, flat plates or prisms, from alcohol, m. p. 89°–90°. *Benzoylparatolylurea*, needles, from alcohol, m. p. 222°–223°. *Benzoylbenzylurea*, colorless prisms, from alcohol, m. p. 165°–166°.

M. T. BOGERT.

On δ-Nitropyromucic Acid. BY HENRY B. HILL AND GEO. R. WHITE. *Am. Chem. J.*, **27**, 193–205.—By the action of concentrated nitric acid upon δ-sulphopyromucic acid, both δ-nitropyromucic acid and α-nitrofurfurane-α-sulphonic acid are produced. The continued action of fuming nitric acid, especially in the presence of sulphuric acid, converts both of these substances into αα-dinitrofurfurane. Nitropyromucic acid may also be prepared by the combined action of nitric and sulphuric acids upon dehydromucic acid or by the action of nitric acid upon a well-cooled solution of pyromucic acid in fuming sulphuric acid. Nitropyromucic acid forms stable salts, but it is rapidly decomposed

Digitized by Google

by an excess of alkaline hydroxide; with barium hydroxide it gives a deep brown insoluble barium salt of undetermined nature. Dinitrofurfurane is readily attacked by barium hydroxide, the reaction being quite complicated, and barium maleate being one of the products. Nitrofurfuranesulphonic acid is likewise decomposed in alkaline solution. *The action of nitric acid upon δ-sulphopyromucic acid.*—As already stated, the action of nitric acid upon the δ-sulpho acid yields a mixture of nitropyromucic acid, nitrofurfuranesulphonic acid and dinitrofurfurane. The nitrofurfurane sulphonic acid is separated by its solubility in water. If the residue then be made feebly alkaline and extracted with ether, the dinitrofurfurane will be recovered. By acidifying the aqueous solution and again extracting with ether, the nitropyromucic acid is obtained. The nitrofurfuranesulphonic acid may be separated from its aqueous solution by means of its difficultly soluble potassium salt. In the preparation of the nitropyromucic acid by the action of nitric acid upon a solution of 100 grams of pyromucic acid in fuming sulphuric acid, there was obtained 17 grams nitropyromucic acid, and 6–12 grams dinitrofurfurane, but no nitrofurfuranesulphonic acid. *Nitrofurfuranesulphonic acid.*—The potassium salt, $KC_4H_2NSO_4$, forms long flat brilliant rectangular prisms which are anhydrous. It is sparingly soluble in cold water, readily in hot. It has not been possible to prepare other salts from it by double decomposition. Concentrated nitric acid converts it to dinitrofurfurane. Heated with hydrobromic acid in a sealed tube at 100° it is completely decomposed, one of the products being apparently bromsuccinic acid (m. p. 160°–161°). *αα-Dinitrofurfurane.*—This may be obtained by the methods already quoted, or, in small amount, by the action of nitric acid, especially in the presence of sulphuric acid, upon dehydromucic acid. It is quite readily soluble in ether, sparingly soluble in cold alcohol, freely soluble in hot alcohol, benzene, or hot chloroform, almost insoluble in carbon bisulphide or ligroin. It dissolves sparingly even in boiling water, volatilizes slowly with steam, and crystallizes from hot aqueous solutions in clustered needles. From alcohol it crystallizes in slender prisms. It is usually pale yellow, but may be obtained nearly colorless by precipitating its benzene solution with ligroin. It melts at 101° and readily sublimes at lower temperatures. *δ-Nitropyromucic acid.*—By mixing ether solutions of nitropyromucic acid and aniline, *aniline nitropyromucate* separates at once in colorless clustered leaflets, sparingly soluble in cold water, ether or cold alcohol, freely soluble in boiling alcohol. It rapidly darkens in the air and its aqueous solution slowly decomposes. By the addition of aniline chloride to dilute solutions of nitropyromucic acid in aqueous sodium acetate, a red body is gradually deposited, with evolution of carbon dioxide, which consists of about 80 per cent.

Digitized by Google

of a *yellow substance*, insoluble in chloroform, and 20 per cent. of a *crimson substance* extracted by chloroform. The yellow substance is sparingly soluble or insoluble in all ordinary solvents except glacial acetic acid, from which it can be crystallized in nearly rectangular four-pointed stars, deep red in color, but giving a yellow powder. It melts at 232° if quickly heated, but several degrees lower when heated slowly. The analytical results correspond to a formula $C_{16}H_{12}N_2O$. Its behavior with various reagents is described. By reduction with zinc dust and glacial acetic acid, succinanil, aniline and ammonia are produced. Analysis of the crimson substance gave figures corresponding to a formula $C_{17}H_{13}N_3O_3$. It is sparingly soluble in alcohol or ether but readily in chloroform, benzene or hot glacial acetic acid. From the latter solvent it crystallizes in flattened crimson needles, melting at 218° when slowly heated, but it appears to begin to decompose below this. Similar compounds were prepared from paratoluidine. The yellow paratoluidine compound crystallizes from glacial acetic acid in clustered prisms which melt at 250° when quickly heated. The corresponding crimson compound crystallizes from glacial acetic acid in finely felted needles which decompose on heating. M. T. BOGERT.

On the Influence of Indigo Red in Indigo Dyeing. BY J. MERRITT MATTHEWS. *J. Soc. Chem. Ind.*, **21**, 222–224.—Natural indigo differs from the synthetic product in containing small amounts of indigo gluten, indigo red and indigo brown. It has been maintained by some that the presence of these substances renders the natural indigo superior to the synthetic, although Schwartzenberg and Schwartz, as early as 1837, showed conclusively that indigo gluten and indigo brown have no effect whatever in dyeing with indigo. Indigo red, however, appears to be a true dyestuff, being reduced with the indigotin to a soluble form, and subsequently fixed on the fiber with the blue. Instead of increasing the beauty of the shade, it is distinctly detrimental to it, the blue becoming dull and cloudy as the amount of indigo red present increases; nor does indigo red increase the fastness of the dye. The statement that indigo red acts as a regulator of the vat has no foundation whatever, either in theory or practice. As it is more difficult to reduce than indigotin, much of it probably remains in the sediment in the vat, although some observers have noticed that, under certain conditions, part of the red dye appears to be changed to indigotin. The reddish cast of fine grades of indigo is not due, as has been erroneously stated, to the presence of indigo red, but to the crystalline form of the pure indigotin. In the preparation of soluble indigo extracts, the presence of indigo red is generally regarded as detrimental, as the colors obtained with the sulpho acids of indigo

Digitized by Google

red are easily washed out. The shades obtained with indigo red alone vary from a reddish to a bluish violet, and are dull and grayish, although just as fast as those obtained with indigotin. The indigo red vat undergoes peculiar changes, with the probable formation of indoxyl, isatin, and indigotin, the reduced indigo red being apparently unstable in solution. It is evident, therefore, that the claim for the superiority of natural indigo based upon its content of indigo red is not supported by the results of investigation. M. T. BOGERT.

BIOLOGICAL CHEMISTRY.

Does the Pancreas Furnish an Enzyme Capable of Transforming Dextrose Into Alcohol and Carbonic Acid? BY MAXIMILIAN HERZOG. *Beitrage chem. Physiol u. Path.*, 2, 102–125.—The results of this research are not conclusive.

F. P. UNDERHILL.

Experiments on the Effects of Injection of Egg-Albumen and Some Other Proteids. BY TORALD SOLLMANN AND E. D. BROWN. *J. Expt. Med.*, 6, 207–257.—The several kinds of injection were carried out upon dogs, rabbits, guinea pigs, etc. Among the conclusions reached are the following: The excretion of injected egg-albumen as such is in no case complete. The quantity retained varies from 23 to 100 per cent. The amount retained varies: (*a*) directly with the slowness of absorption; (*b*) directly with the time during which the proteid remains in the body; (*c*) inversely to the quantity injected; (*d*) with individual peculiarities. Egg-albumen injected into the hen is excreted as in mammals. The albuminuria lasts in typical cases from one and one-half to three days, according to the manner of administration. A small amount of proteid is excreted unchanged by the feces. The total nitrogen excretion is increased beyond the amount of nitrogen introduced as albumen. The effects of intravenous injection of egg-albumen on circulation and respiration do not differ from those of an equivalent injection of the solvent. The injection of egg-albumen, alkaline egg-syntonin or muscle extracts causes, in rabbits, a rise of temperature of 1° to 2° C. The injection of egg-albumen causes but very slight histological changes.

F. P. UNDERHILL.

A Contribution to Our Knowledge of the Action of Saponin on the Blood Corpuscles and Pus Corpuscles. BY G. N. STEWART. *J. Expt. Med.*, 6, 257–277.—The increase of conductivity produced by saponin in formaldehyde-hardened blood is due to an increase in the conductivity of the corpuscles (increased permeability of the corpuscles to ions) and not, mainly at any rate, to the liberation of electrolytes from the corpuscles and conse-

Digitized by Google

quent increase in conductivity of the serum. The increase in the permeability of the corpuscles is probably caused by a "corrosive," dissolving, or emulsifying action of the saponin on some non-proteid constituent of the envelope or stroma. In the first stage of the action of saponin on blood (not fixed by formaldehyde) there seems also to be an increase in the permeability of the corpuscles for ions, even before any hemoglobin has been liberated. Heating the blood to 40° to 45° C. intensifies the laking action of saponin. The conductivity of the pus corpuscles is increased by the action of saponin, just as is the case with blood, and apparently very much in the same way, that is to say, by an action on the corpuscles and not on the serum. The fixing of the pus corpuscles by formaldehydes does not hinder this action of saponin. F. P. UNDERHILL.

The Nature of Nerve Stimulation and of Changes in Irritability. By A. P. MATHEWS. *Science*, 15, 492–499.—The sciatic nerve of the frog was used in this work, and stimulation was shown by contractions of the gastrocnemius muscle. The nerves were immersed for the greater part of their length in the various solutions to be tested. To be noted are the following conclusions: Protoplasm consists essentially of a colloidal solution, the particles of which are positively charged. It is a reversible hydrosol. Stimulation consists in the passing of the solution to or towards the gel. Irritability is reduced or abolished if we make the sol state more stable, or if gelation is complete. In other words, irritability varies inversely with the stability of the hydrosol.
F. P. UNDERHILL.

Snake Venom in Relation to Hemolysis, Bacteriolysis, and Toxicity. By SIMON FLEXNER AND HIDEYO NOGUCHI. *J. Expt. Med.*, 6, 277–302.—The action of all available kinds of venom was tried on the blood of the dog, rabbit, pig, ox, sheep, frog, etc. The following are some of the more important conclusions obtained from this research. The agglutinating power of venom is destroyed by a temperature of 75°–80° C., maintained for thirty minutes. Venom contains several or many intermediary bodies. These bodies show specific affinities for certain complements. Venom contains principles which are agglutinating and dissolving for white blood-corpuscles. The agglutinating principles may be identical for both red and white cells. The dissolving principle for leucocytes is distinct from that for red cells. The several varieties of white cells of the rabbit's blood show different susceptibilities to the action of venom. All venoms when used in suitable quantities destroy the bactericidal properties of many normal blood sera. The manner of this destruction consists in the fixation of the serum-complements by the venoms. Venoms have no action upon the intermediary bodies of serum.

Digitized by Google

Antivenin neutralizes venom and removes both the hemolytic and anti-bacteriolytic actions. F. P. UNDERHILL.

On the Quantitative Determination of Total Sulphates in Urine. BY OTTO FOLIN. *Am. J. Physiol.*, 7, 152–155.—A short and accurate method for the determination of the total sulphates in urine is here given: Fifty cc. of urine are measured into a small Erlenmeyer flask, and after adding about 0.2 gram of pure potassium chlorate and 4 cc. chemically pure hydrochloric acid (sp. gr. 1.20), the mixture is gently boiled for from ten to twenty minutes. At the end of this time the contents of the flask should be almost as clear as water. If the contents are not colorless, or if they have been clear but have begun to grow dark again, the flask may be taken off the fire and a few more grains of potassium chlorate added which will clear the urine at once. Twenty-five cc. of barium chloride solution (60 grams crystallized barium chloride to the liter) are next added, and the mixture is kept hot, but not boiling, for about forty-five minutes. The mixture can then be filtered, and an absolutely clear filtrate obtained. The barium sulphate precipitate is now washed with hot water, and alternately a few times with a hot 5 per cent. ammonium chloride solution. 100 cc. of ammonium chloride solution, and not less than 500–700 cc. of hot water should be used in the washing. The moist filter-paper containing the precipitate is folded, transferred to a weighed porcelain crucible, and two or three cubic centimeters of strong alcohol are poured on the filter and ignited. The burning alcohol dries the filter-paper without sputtering, and with scarcely any loss of time. The remainder of the method is identical with that of an ordinary sulphate determination. F. P. UNDERHILL.

On Phosphate Metabolism. BY OTTO FOLIN AND PHILIP A. SHAFFER. *Am. J. Physiol.*, 7, 135–152.—As a result of a long-continued series of experiments on an insane person it was observed that on those days when the patient's condition was most abnormal there was an increased elimination of phosphate by the kidneys. On a constant diet the same periodicity, corresponding to the patient's mental condition, was observed, so that the increased phosphate excretion is to be ascribed to the metabolism of the patient rather than to the food introduced into the body. F. P. UNDERHILL.

Chemical Studies of Elastin, Mucoid, and Other Proteids in Elastic Tissue, with Some Notes on Ligament Extractions. BY A. N. RICHARDS AND WILLIAM J. GIES. *Am. J. Physiol.*, 7, 92–135.—By an improved method of preparation several samples of ligament elastin were made, having the following average composition:

Digitized by Google

C	H	N	S	O
54.14	7.33	16.87	0.14	21.52

All of these preparations contained sulphur, but none of it could be split off as sulphide by boiling with caustic alkali. Only very small proportions of elastin could be split off in the form of ammonia and hexone bases on decomposition with acid. Arginin, lysin and histidin have been identified among the basic bodies separated in this way. Elastin is not a "fat-proteid compound." The purified powdered elastin readily digested in pepsin-hydrochloric acid; elastoses and true peptone were found, proto-elastose predominating in quantity. The average combustion equivalent of four preparations of elastin was 5,925 small calories. Ligament contains mucoid having the general qualities of other connective tissue glucoproteids. Extracts of ligament contain proteid coagulating at 56°, 65°, 75°, and 82° C.

A slight amount of nucleoproteid is contained in ligament and was detected in aqueous and saline extracts. The gelatin obtained from ligament has the following composition:

C	H	N	S	O
50.49	6.71	17.90	0.57	24.33

The heat of combustion of ligament gelatin was found to be equal to 5,276 small calories. Among the crystalline extractions obtainable from ligamentum nuchæ were creatin, hypoxanthin, and guanin. F. P. UNDERHILL.

Ergographic Studies in Muscular Soreness. BY THEODORE HOUGH. *Am. J. Physiol.*, 7, 76–93.—The ergographic methods used in this series of experiments were the same as those used in former experiments (see Hough, *Am. J. Physiol*, 5, 258–259). There are two kinds of muscle soreness. The first is very marked during work and may be noticeable for two or three hours afterward; it then passes away entirely. The second kind is not noticed at all at the time of the tracing nor for some time afterwards; it usually begins about eight hours after the work increases to a maximum which may occur from ten to twenty-four, or even more hours later; indeed this soreness may not make its appearance until the second day after the tracing; it gradually passes away but may be noticeable for four or more days. The first kind of soreness would seem to be due to the same causes as those which produce fatigue, namely the presence of the diffusible waste products of fatigue. There are reasons for thinking that the second kind of soreness is fundamentally the result of ruptures within the muscle. F. P. UNDERHILL.

Effects of Potassium Cyanide and of Lack of Oxygen upon the Fertilized Eggs and the Embryos of the Sea-Urchin (*Arbacia Punctulata*). BY E. P. LYON. *Am. J. Physiol.*, 7,

Digitized by Google

56–76.—There is a loss in resistance of potassium cyanide during the development of the sea-urchin egg. Each cleavage from the very first increases the susceptibility. Development is slightly hastened in very weak solutions of potassium cyanide. By prolonged exposure of arbacia embryos to the poison, the union of the cells is weakened. On transference to sea-water, the cilia may recover and the cells under the influence of ciliary motion may swim away from the embryo. The whole organism thus collapses. Unsegmented eggs placed in cyanide for a time and then returned to sea-water may go on developing. But the poison has so effected them that as soon as cilia are developed, the embryos disintegrate. Lack of oxygen brought about by a current of hydrogen produces the same result. Some degree of immunity to potassium cyanide can be induced by raising embryos from the start in very weak solutions of the poison. From fertilization to a point ten or fifteen minutes after fertilization the resistance of the egg to potassium cyanide diminishes. From the most susceptible stage there is an increase in resistance up to the time of the first cleavage. Very soon after division there is another susceptible period followed by another increase in resistance. Similar variations have been found in the interval between the second and third cleavage. Similar changes in resistance are found when the eggs are subjected to hydrogen and consequent lack of oxygen. There is a susceptible period about ten minutes after fertilization, followed by a much more resistant period.

F. P. UNDERHILL.

On the Effects of Various Solutions on Ciliary and Muscular Movement in the Larvae of Arenicola and Polygordius. II. BY RALPH S. LILLIE. *Am. J. Physiol.*, 7, 25–56.—Each of the chlorides NaCl, $MgCl_2$, $CaCl_2$, and KCl exercises a definite specific influence on the properties of the contractile tissues; this influence is evident even in the presence of other salts. The inference is that each salt forms within the tissues a salt-proteid compound (ion-proteid) possessing definite physical properties. For normal activity these various compounds must be present in the tissues in certain definite proportions. The salt-proteid compounds are dissociable, and the salts are thus readily replaced by one another in the tissues with corresponding changes in the properties of these. Potassium salts are peculiar in forming combinations that are not readily dissociable; hence their specifically injurious influence on muscular contractility. In non-electrolyte solutions the active properties of the tissues are gradually lost; the addition of small quantities of isotonic salt solutions to the non-electrolyte solution prevents the immediate loss of the properties that are favored by the presence of these salts. Development may proceed in favorable artificial mixtures of sodium chlo-

Digitized by Google

ride, magnesium chloride and calcium chloride; it is hindered by the presence of a trace of acid and furthered by the presence of a trace of alkali. F. P. UNDERHILL.

On the Effects of Solutions of Various Electrolytes and Non-Conductors upon Rigor Mortis and Heat Rigor. BY ANNE MOORE. *Am. J. Physiol.*, 7, 1–25.—Stewart's and v. Fürth's conclusion that two proteids exist in muscle capable of coagulation receives support. In general, hypotonic solutions lower the temperature of coagulation and shorten the time of completion of rigor. Acids increase the temperature of opalescence and lower the temperature of coagulation. Alkalies lower the temperature of opalescence and increase the temperature of coagulation. Rigor occurs readily in acids and alkalies at room temperature, but it is incomplete. The chlorides in solutions isosmotic with $\frac{n}{8}$ sodium chloride show practical uniformity; the temperature of opalescence is raised, that of coagulation is only slightly affected. Rigor occurs readily at room temperature in strong solutions of sodium chloride, sodium sulphate, magnesium sulphate, and calcium sulphate, in all strengths of calcium chloride and ammonium sulphate, and in other calcium precipitating solutions. Although the entrance of water favors coagulation and lowers the coagulation temperature, coagulation phenomena cannot be explained entirely on the basis of osmosis. Normal rigor is not comparable to ordinary muscular contraction. Heat rigor is not essentially different from normal rigor. Normal rigor is probably due to the lowering of the coagulation temperature of muscle proteids caused by the unwonted presence or juxtaposition in the tissue of acid, of water, or of certain salts. F. P. UNDERHILL.

PHARMACEUTICAL CHEMISTRY.

Does the Root of Collinsonia Canadensis Contain an Alkaloid? BY H. M. GORDIN. *Druggist's Circular*, 46, 29.—Only two references could be found in the literature. C. N. Lochman failed to find an alkaloid. H. J. Lohman claims to have isolated with the greatest ease a large quantity of a crystalline alkaloid. Gordin was suspicious of the method employed by the last author and went over the ground again. A considerable quantity of beautiful colorless crystals was obtained without any difficulty, but these were found to be nothing more than magnesium phosphate. There was no trace of alkaloid found.

J. O. SCHLOTTERBECK.

Occurrence and Detection of Berberine in Plants. BY H. M. GORDIN. *Druggist's Circular*, 46, 29.—By the author's very exact methods of estimating berberine the detection of 0.001 gram

Digitized by Google

berberine in 10 cc. water is easily effected. These methods are based upon the formation of a very insoluble crystalline acetone compound.

At least a score of different plants are reported in the literature as containing berberine but according to recent examinations by the author many of them do not contain the slightest trace of this alkaloid. *Berberis vulgaris*, *Berberis aquifolia*, *Hydrastis canadensis*, *Xanthorrhiza appiifolia*, and *Coptis trifolia* contain berberine while Calumba root, *Pareira Brava*, *Menisperum canadense* and *Jeffersonia diphylla* do not contain any.

J. O. SCHLOTTERBECK.

Note on the Estimation of Berberine. BY H. M. GORDIN. *Am. J. Pharm.*, 74, 37; also *Archiv. der Pharm.*, 239, 629.—As a result of experiments upon different plants in which the berberine is apparently differently combined the author offers a slight modification of his previously published methods.

J. O. SCHLOTTERBECK.

Poisonous Properties of Mountain Laurel. BY H. H. RUSBY. *Druggist's Circular*, 46, 27. J. O. SCHLOTTERBECK.

Fallacious Test for Glucose in Cane-Sugar Syrup. BY J. S. MAYER. *Druggist's Circular*, 46, 27.—The writer cautions against jumping to the conclusion that mere reduction of metallic salts in alkaline solutions of cane-sugar or sugar syrup indicates the addition of commercial glucose. He emphasizes the importance of the optical test, or for pharmacists, the iodine test as follows: Fill a watch-glass half full of the syrup to be tested, then add 8 or 10 drops of a saturated solution of iodine in 50 per cent. alcohol; if the sample is free from glucose the iodine is dissipated after a short time and the syrup remains colorless; in the presence of glucose, the syrup is either brown or contains a brown precipitate, the color being the best observed by placing the watch-glass on a sheet of white paper. J. O. SCHLOTTERBECK.

The Presence of Copper in Powdered Drugs and Chemicals. BY E. H. GANE. *Jour. Soc. Chem. Ind.*, 31, 224.—The author ascertained that the small amounts of copper which had been found in certain drug powders could not be found in the original crude drug, thus demonstrating that the copper was not absorbed by the plant from the soil. After tedious search the true source of contamination was found to be the copper rivets in the driving belts. Small particles were thrown off because of friction and found their way into the hopper. The substitution of rubber belts has completely obviated the difficulty.

J. O. SCHLOTTERBECK.

Digitized by Google

SANITARY CHEMISTRY.

Water Purification. By P. A. Maignen. *J. Western Soc. Eng.*, **8**, (1902) 58–79.—A short account of various methods used for filtering water, both on a large and a small scale, and a description of a domestic filter invented by the author, made up of two porous walls with "flexible" porous-asbestos cloth, and two granular charcoal layers. Filtration takes place from the outside to the inside, the water coming in contact first with an asbestos cloth, then with a layer of coarse charcoal, afterwards fine charcoal, and then with a second layer of asbestos cloth.

The author makes the following rather remarkable statement regarding the filter: "The materials used in the filter contain, when new, air spores, which become bacteria after they are wetted by the filtering water, and it takes a good long time before all these constitutional bacteria have worked their way out." The paper concludes with a description of what the author calls a "water scrubber," which is an artificial filtering membrane made of asbestos fiber, placed on top of a sand filtration bed, and the work done by the "scrubber" is shown by an account of experiments made at the Experimental Water Filtration Plant at Philadelphia, where the scrubber, according to the author, removed 98.6 per cent. of the bacteria present in the water, while the scrubber and sand bed removed 99.9 per cent.

Leonard P. Kinnicutt.

The Evolution of the Oxygen Absorption Test in Water Analysis. By J. B. Weems.—Paper read before the Iowa Engineering Society at their thirteenth annual meeting held at Davenport, January 16–19, 1901. Paper published in pamphlet form.

This paper gives in historical order an outline of the various modifications of the permanganate method for determining the amount of oxidizable matter in water, with references to the original papers.

The credit of first proposing the use of potassium permanganate to determine the organic matter in water belongs to Forchhammer, his paper on the subject being published in 1849.

In 1863, Dr. Woods suggested that the water should be heated to 60° C. before adding the permanganate. In 1865, Miller published a paper suggesting the use of potassium iodide to decompose the excess of permanganate, and the titration of the iodine set free by sodium thiosulphate, and that the time allowed for the action of the permanganate on the oxidizable substances in the water should be three hours.

Digitized by Google

In 1867, Kubel introduced the method, now known by his name, which differed from those mentioned in that the solution was boiled for five minutes after the addition of the permanganate, and the excess of permanganate used determined by titration with oxalic acid.

About the same time Schulze suggested that instead of adding sulphuric acid to the water, sodium hydroxide should be added, so that the oxidizing action of the potassium permanganate should take place in an alkaline solution.

In 1879, Tidy recommended Miller's method with the addition that two determinations of oxygen consumed be made on each sample, allowing the permanganate to act on one sample for one hour, and on the other for three hours.

The method recommended by the Society of Public Analysts in England in 1881 (*Analyst*, **6**, 136) is essentially Miller's method, two determinations of each sample however being made, one fifteen minutes after the addition of the permanganate, the other after three hours, the temperature of the sample in each case being kept at 80° F.

The method, however, recommended by the Chemical Section of the American Association for the Advancement of Science "Examination of Water," Leffmann and Beam, 2nd edition, p. 40), is Kubel's method, slightly modified, the solution, after the addition of the potassium permanganate and sulphuric acid, being kept at the boiling temperature for ten minutes.

Mention is also made of Mr. Scudder's method, which differs from the method of the English public analysts in that three determinations are made, one at the end of three minutes, one at the end of fifteen minutes, and one at the end of four hours.

The paper concludes with quotations from an article (*Analyst*, 7, 190) in which Prof. Mallet states that in view of the evidence obtained, rendering probable the loss of organic matter by volatilization in the use of acidified permanganate at a boiling temperature, the Tidy form of the process is rather to be recommended than that of Kubel, if but one is to be used, but that the time during which the permanganate is allowed to act should be increased to at least twelve, or better, twenty-four hours.

LEONARD P. KINNICUTT.

No mention is made in the paper of the method recommended by the Committee of the Public Health Association on Standard Methods of Water Analysis, George W. Fuller, chairman, and given in their report at the annual meeting in 1900 (*Science*, **12**, 3910) which is Kubel's method, the potassium permanganate and sulphuric acid being added to the water when cold, the solution then heated to boiling and kept at the boiling temperature for just five minutes.

LEONARD P. KINNICUTT.

Digitized by Google

German Experiments with Sewage Treatment by Septic Tanks and Contact Filter Beds. *Eng. News*, 47, 291 (1902). —This article is a review, copied from the *London Surveyor*, of a pamphlet of 141 pages, written by Professor Dunbar and Dr. Thum, of Hamburg, and published by Oldenburg, of Munich. It contains the results of a long series of experiments extending over three and one-half years, on the bacterial treatment of sewage. Especial attention was paid to the English method of contact beds, and to the difference in their action when used with crude sewage and with septic sewage. The results obtained are different from those found by most observers, as there was very little difference in the amount of purification whether crude or septic tank sewage was run upon the bed, and the loss of liquid capacity of the contact bed was just as great when clarified or septic sewage was run upon the bed as when crude sewage was applied. A possible explanation of this rather surprising result is that when filling the bed with septic tank sewage, about one-third of the total contents of the tank was run out of the tank in a few minutes. This method of working a septic tank must have brought a large amount of suspended matter into the liquid run upon the bed.

The contact beds had a capacity of 7,000 to 8,000 gallons, and the methods of working the beds, periods of contact, the material used for filling, and the size of filling material, were frequently changed, and in all cases a satisfactory effluent was obtained.

Elaborate data are given as to the sludging up of the contact beds, *i. e.*, loss of liquid capacity, but all the data so obtained is from crude sewage and one contact. It was found that with 1 filling per day, after 700 fillings, the original capacity of the bed was reduced about one-half, with 2 fillings per day, about two-thirds. Periods of rest of even four weeks at a time were found to be useless, for though the volume of sewage taken immediately after rest was considerably greater than before the rest, this increased liquid capacity was all lost again after two or three weeks of work.

Forking over the surface, flushing or trenching out the material *in situ* caused no perceptible improvement. The only satisfactory method was the removal of the filling material of the bed and washing it with clean water. It was found that about 10 per cent. of the bulk of the material was lost in washing and that the cost was 28 cents per cubic foot, only 9 cents per hour being paid for labor.

Experiments with trade liquors showed that the wastes from a beet sugar factory, a brewery, a yeast factory, and a tannery, could all be satisfactorily treated by the double contact method, preceded by sedimentation. LEONARD P. KINNICUTT.

Digitized by Google

Report on the St. Louis Water Supply by an Expert Commission. By R. E. McMath. *Eng. News*, 47, 196–199 (1902). —This paper is a very full account of majority and minority reports of the expert commission appointed by the city of St. Louis "to examine the present water plant of the city and to submit a report with estimates and recommendations as to the most feasible manner of providing an adequate supply, both present and prospective, of clear, wholesome water."

The majority report, signed by Mr. Benezette Williams and George Y. Wisner, recommends abandoning the Mississippi River as the source of supply, and advocates a gravity supply from the Meramec River drainage area, which includes the well-known Meramec Spring at the head of the river.

The reasons given for abandoning the Mississippi River as a source of supply are that if the water from the Mississippi is to be used, it must be filtered, and that there is no plant in existence adapted to the treatment by filtration of such water as the Mississippi furnished at St. Louis, and consequently the success of such treatment would be experimental. That sand filters are not germ proof and there is no evidence to prove that pathogenic germs are removed in the same proportion as are ordinary water bacteria. That with the Mississippi water, a large amount of sulphate of aluminum must be used as a coagulant, and this will so raise the amount of carbonic acid and sulphate of lime in the filtered water as to increase incrustation on boilers and the corrosion of metals in general. That the hardness of the Mississippi water may be considered to be 13.72 while that of the Meramec is only 8.4. That the estimates make the cost of supplying water by filtration during fifty-five years greater per million gallons than if the water is taken from the Meramec water-shed.

The minority report, signed by Allen Hazen, recommends using the Mississippi water after filtration, on the following grounds: That the filtration plan is more economical than the plan recommended by the majority of the committee. That the maximum capacity of the gravity plant is only 201,000,000 gallons per day, while the filters, settling basins and appurtenances proposed for the filtration plant are on a 300,000,000 gallon basis.

That though the water of St. Louis is difficult to treat, and will require more thorough methods than are needed elsewhere, and though to some extent the work is novel and experimental, all the important principles are well understood from experiments elsewhere. That the hygienic quality of the water will be satisfactory. That in soap-consuming power the filtered water will not differ materially from the Meramec water.

That there will be no seriously objectionable results from the use of a coagulant. That the amount of sulphate of lime in the

Digitized by Google

filtered water has been overestimated by the majority of the committee, and will not cause serious trouble.

That in sanitary quality the filtered water will fully equal the gravity supply, in physical appearance it will be better, for mechanical purposes it will be as good, for boilers it will be less desirable, but the difference will not be great.

Mr. Hazen's report is supplemented by two communications from Mr. George W. Fuller, which are, in general, endorsements of Mr. Hazen's report, including estimates of cost.

LEONARD P. KINNICUTT.

A Sewage Disposal System for a Country House. BY WM. C. TUCKER. *Amer. Architect*, 75, 61 (1902).—A description, with illustrations, of a sewage disposal plant for a country house. It consists of two closed chambers, each sufficiently large to contain one day's supply of sewage from the house, a siphon chamber, and an irrigation field. The sewage is carried onto the irrigation field by a series of 3-inch porous irrigation tiles. These are laid 10 inches below the surface of the ground, and are covered by small stones. LEONARD P. KINNICUTT.

Present Status of the Sewage Problem in England. LEONARD P. KINNICUTT. *Eng. Record*, 45, 295 (1902).—The article is an abstract of a paper read by Dr. Kinnicutt, at the Annual Meeting of the Boston Civil Engineering Society March 19, 1902. The paper in full will be published in the journal of the Association of Engineering Societies.

LEONARD P. KINNICUTT.

Ozone for Water Sterilization. Based on an article by DR. ERLEVEN in *Ztschr. Elektrochemie*, November 14, 1901. *Scientific American Supplement*, March 8, 1902, p. 21,889.—An account of the experimental plant erected by Siemens and Halske at Martinikfelde, near Berlin in 1895, and operated since that time.

The plant has the capacity of treating 350 cubic feet per hour. It consists of an air-pump, which forces dry air through an ozonizer; of a sterilizing tower, a revolving mechanical sand filter, two tanks for unfiltered and filtered water, and a water pump.

The sterilizing tower is packed with pieces of flint, and ozonized air passes up through the tower, coming in contact with the water from the sand filter as it passes downward over the pieces of flint.

The yield of ozone, whether the plate or tube form of ozonizer is used, is from 20 to 25 grains per electrical H. P., when the concentration of the ozone in the air passing from the ozonizer lies between $2^1/_2$ and 3 grains per cubic meter.

Tests made, using water from the River Spree, showed that the

Digitized by Google

number of bacterial organisms was reduced from numbers between 100,000 and 600,000 to under 10 per cubic centimeter. The amount of oxygen consumed was reduced 18 per cent. and the aeration of the water increased 10 per cent. Neither ozone nor nitric acid could be detected in the treated water. The consumption of ozone amounted to 2 grains per cubic meter and the cost of treatment for an installation yielding 120–150 cubic meters per hour, including interest and depreciation of plant equaled about 40 cents per 100 cubic meters of water. LEONARD P. KINNICUTT.

AGRICULTURAL CHEMISTRY.

The Soil as an Economic and Social Factor. By FRANK K. CAMERON. *Pop. Sci. Monthly*, 60, April, 1902, pp. 539–550.—This paper deals in part with the nature and composition of soils, the exhaustion and improvement of soils, the action of soil bacteria, the control of atmospheric conditions as affecting the productiveness of soils, and the adaptability of soils to crops.

H. W. LAWSON.

Results of Investigations on the Rothamsted Soils. By BERNARD DYER. *U. S. Dep. Agr., Office of Expt. Stations Bull. No.* 106, pp. 180.—The series of lectures delivered before the convention of the Association of American Agricultural Colleges and Experiment Stations at New Haven and Middletown, Conn., November, 1901, by Dr. Dyer as the representative of the Lawes Agricultural Trust is published in full. The lectures were based upon extended investigations of soils which had been in continuous wheat culture for fifty years. In all between 4,000 and 5,000 samples of soils, taken at different depths and at intervals of several years, from plats receiving different fertilizer applications were systematically studied, and the results as regards the principal fertilizing ingredients and chlorine in the soils, their availability, migration in the soil, etc., were presented in the lectures. It was shown that continuous wheat culture is an extravagant practice, that very little nitrification takes place in the depths of the subsoil, and that lime is removed from the soil through the influence of ammonium salts rather than nitrate of soda. Many other interesting points were brought out. H. W. LAWSON.

Willis and Huntsville Tobacco Soils. By H. H. HARRINGTON AND P. S. TILSON. *Tex. Agr. Expt. Sta. Bull. No.* 61, pp. 14.—Chemical and mechanical analyses of twenty-four samples of tobacco soils from two localities in Texas are given and compared with analyses of six samples of soils from the Connecticut Valley. "A comparison of Connecticut and Willis soils shows a difference in favor of Willis for high-grade Havana wrapper or filler." Ash analyses and determinations of the content of nitro-

Digitized by Google

gen of four samples of tobacco from each locality are also reported. In samples examined, the nicotine content ranged from 1.75 per cent. in the wrapper to 2.50 per cent. in the filler.

H. W. LAWSON.

Stable Manure and Nitrogenous Chemical Fertilizers for Forcing Lettuce. BY S. A. BEACH AND H. HASSELBRING. *N. Y. (Geneva) Agr. Expt. Sta. Bull. No.* 208, pp. 307–342.—In experiments extending over several years a comparison was made of dried blood, nitrate of soda, dried blood and nitrate of soda combined, and sulphate of ammonia for forcing lettuce under glass. These fertilizers were used alone and in combination with different quantities of stable manure. An excess of phosphoric acid and potash over the requirements of the plants was used in each case. Stable manure was also applied alone. The experiments were conducted in duplicate with a light sandy loam and a medium clay loam, the latter proving to be the better forcing soil. Commercial fertilizers used alone gave better results than no fertilizers, but did not force the crop rapidly enough to be profitable. The addition of stable manure to the commercial fertilizers greatly increased the yields, 5 and 10 per cent. applications giving proportionately better results than 15 and 20 per cent. applications. When used alone, nitrate of soda gave the best results on the clay soil and dried blood on the sandy soil. When combined with stable manure, dried blood in general proved superior to the other chemical fertilizers.

H. W. LAWSON.

Plant Food Trials. BY H. E. STOCKBRIDGE. *Fla. Agr. Expt. Sta. Rep.*, 1901, pp. 22–35.—Several fertilizer applications for sweet potatoes, sugar-cane, potatoes, corn, cotton, and cassava have been compared in plat experiments extending over three years. Some of the results obtained are here reported.

H. W. LAWSON.

Field Experiments with Fertilizers. BY C. S. PHELPS. *Conn. (Storrs) Agr. Expt. Sta. Rep.*, 1900, pp. 34–60.—Results for 1900 are given of experiments which have been in progress since 1888. In tests with corn, cow peas, and soy beans a comparison was made of different quantities of nitrogenous fertilizers applied with uniform quantities of phosphoric acid and potash. The best yields of corn were obtained from the use of 25 to 50 pounds of nitrogen per acre in the form of nitrate of soda in addition to the mineral fertilizers. The percentage of protein in the crop was greatest where the largest quantities of nitrogenous fertilizers were applied. The yield of cow peas and soy beans and the percentages of protein in the crops were not materially increased by the use of nitrogenous fertilizers over the use of mineral fertilizers alone. In a soil test, nitrogen and phosphoric acid were found

Digitized by Google

necessary for good yields of oats. The results are considered as indicating that the fertilizer requirements depended more upon the peculiarities of the crop grown than upon the deficiencies of the soil.

H. W. LAWSON.

An Experiment on Soil Improvement. By C. S. PHELPS. *Conn. (Storrs) Agr. Expt. Sta Rep.*, 1900, pp. 61–65.—Clover grown as a catch crop with corn and plowed under for potatoes proved a valuable manure in a rotation experiment.

H. W. LAWSON.

Pot Experiments with Nitrogenous Fertilizers. By C. S. PHELPS. *Conn. (Storrs) Agr. Expt. Sta. Rep.*, 1900, pp. 158–174.—Detailed data are given for experiments with oats, Hungarian grass, orchard grass, and soy beans. The work is to be continued with some modifications, and deductions are deferred until additional results can be secured. H. W. LAWSON.

Development and Distribution of Nitrates in Cultivated Field Soils. By F. H. KING AND A. R. WHITSON. *Wis. Agr. Expt. Sta. Rep.*, 1901, pp. 210–231.—Determinations were made at frequent intervals during the season of the nitrates in each foot of soil to a depth of 4 feet under different field crops. As compared with similar data for 1900, the results show, on the whole, an increase of nitrates in the 4 feet of soil, the difference being 131.54 pounds in the spring and 291.93 pounds in the fall. Causes accounting for this excess are suggested. The nitric nitrogen in the crops grown was also determined, the colorimetric method employed being given and a source of error in total nitrogen determinations for plants being pointed out. The nitrates in the crops, especially corn, decreased with the maturity of the crop. The stems showed a greater percentage of nitrates than the leaves. "Everywhere the degree of concentration of nitrates in the sap of the plant stems is much higher than it is in the soil moisture. This appears very strange from the physical point of view and much more in harmony with the views formerly held by Berthelot and André, that nitrate of potash is continually formed in the stems of plants, but not accepted as correct by most authorities at present." Determinations made late in November and early in the following April showed a total increase of nitrates in 4 feet of soil of 79.27 pounds per acre during the winter. This increase is considered due to nitrification in the soil and to the capillary rise of water from below 4 feet. Laboratory experiments conducted by J. O. Belz showed that considerable nitrification may take place at 35° F., the rate being nearly one-sixth that at 90° F. Early fall plowing favored the development of nitrates as determined the last of September and

Digitized by Google

the middle of April. Late fall plowing was apparently unfavorable to the development of nitrates during the following spring.
H. W. LAWSON.

Studies on Black Marsh Soil. BY F. H. KING AND A. R. WHITSON. *Wis. Agr. Expt. Sta. Rep.*, 1901, pp. 232–236.—Oats and alfalfa were grown on black marsh soil in 3-foot cylinders in plant-house experiments. In one series of cylinders the crops were entirely removed and in another series they were returned to the soil as green manure. The value of the green manuring was shown very decidedly in a following crop of corn. The increased yield of corn was especially marked after oats and on the poorer of the two grades of soil used. In field experiments with corn on this kind of soil potassium sulphate was more valuable than dried blood or stable manure in one fertilizer test, and stable manure was more valuable than potassium chloride or dried blood in another test. H. W. LAWSON.

Experiments in Sugar Beet Culture during 1900 and 1901. BY F. W. WOLL AND R. H. SHAW. *Wis. Agr. Expt. Sta. Rep.*, 1901, pp. 261–276.—Analyses are given of a large number of samples of sugar beets grown in various culture experiments at the station and by farmers throughout the State.
H. W. LAWSON.

Sixth Report on Food Products. BY A. L. WINTON, *et. al. Conn. (State) Agr. Expt. Sta. Rep.*, 1901, *Part II*, pp. 95–226.—During the year ended July 31, 1901, the station examined 1,686 samples of food products, of which 1,154 were purchased by agents of the station. Analyses and other data are presented in tabular form and discussed, and methods of analysis employed in the examination of many of the food products are given. Out of 1,256 samples, 441 were found variously adulterated. The structure of the cocoanut is described with especial reference to the detection of this material as an adulterant of ground spices.
H. W. LAWSON.

Report of the Professor of Chemistry. BY R. HARCOURT. *Ont. Agr. Col. and Expt. Farm Rep.*, 1901, pp. 35–42.—The report includes analyses of a number of samples of feeding stuffs and sugar beets. H. W. LAWSON.

Fertilizers. *Me. Agr. Expt. Sta. Bull. No.* 81; *Md. Agr. Col. Quart., Feb.*, 1902; *Mass. (Hatch) Agr. Expt. Sta. Bull. No.* 81; *N. C. Bd. Agr. Bull., Feb. and March*, 1902; *N. H. Agr. Expt. Sta. Bull. No.* 88; *Ohio State Bd. Agr. Rep.*, 1901; *Pa. Dept. Agr. Bull. No.* 89.—Analyses and other data relating to fertilizers. H. W. LAWSON.

Digitized by Google

PATENTS.

DECEMBER 10, 1901.

688,478. Oscar Mueller, Buffalo, N. Y. Assignor to Schoelkopf, Hartford and Hanna Co., same place. **Black dye,** from aminonaphthol disulpho acid H, and a tetrazo compound, combined in an acid solution, the product is further united with a diazo compound and an aromatic radical in alkaline solution. Soluble in water blue to green-black, and in concentrated sulphuric acid blue-black, and insoluble in benzene and toluene.

688,510. William H. Green and William H. Wahl, Philadelphia, Pa. **Obtaining metals** by mixing silicides with metallic oxides, whose heat of formation is less than that of either element of the silicide, as aluminum silicide, heating the mixture and effecting the primary reduction of the oxide by the chemical energy of both elements of the silicide.

688,538. Theodore Meyer, Offenbach, Germany. Assignor one-half to Charles Glaser, Baltimore, Md. Apparatus for making **sulphuric acid.** Consists of a series of horizontal cylinders arranged one above the other on a slope with pipes connecting the top of one with the center of the next below and through which the gases pass, while other pipes connect the bottoms all together leading downward.

688,557. Benjamin Talbot, Pencoyd, Pa. **Manufacturing iron or steel.** Provides a bath of molten metal having less than 0.015 per cent. of carbon and maintaining on the surface of said bath a slag of oxide capable of removing carbon in greater percentage than required for oxidizing the metal in contact therewith, bringing additional molten metal in contact with the slag thereby producing large volumes of carbon monoxide, and burning said gas to make an intense heat, and using said heat to purify the metal.

688,562. Henry Watkin, Burslem, England. **Temperature indicator for kilns.** A rectangular brick with cup-shaped pockets on top, and small pieces of metals of different melting-points to rest in the pockets and show the temperature they are exposed to by fusing.

688,576. Oscar Bally, Mannheim, Germany. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. **Green dye** of the anthracene series from monoalphylidoanthraquinonemonosulpho acid and bromine, melting the halogen derivative with an aromatic amine, and sulphonating the product. The solution in water varies from a cherry to a yellow-red, soluble in alcohol and in concentrated sulphuric acid, the latter

Digitized by Google

olive-brown, and dyeing wool red to yellow-red, turning green on chroming.

688,604. Max Dietrich and Alfons Langer, Berlin, Germany. Making **blood albumen.** Makes a lime paste of 50 per cent. calcium hydroxide, adds 5 per cent. of it to blood defibrinated, dries and grinds the mass, then washes out the soluble portions and dries it again.

688,628. Edward Gable, Baltimore, Md. Process of treating material for **musical instruments** by applying to the resonant part a mixture of lime and soda, allowing it to dry and then removing it from the wood.

688,645. Max H. Isler, Mannheim, Germany. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. **Blue anthracene dye.** Condenses a halogenated substituted anthraquinone with an aromatic amine in the presence of sodium acetate. It dyes unmordanted wool blue and gives blue solution in aniline; with concentrated sulphuric acid to which boric acid has been added it is blue with a red fluorescence.

688,646. Paul Julius, Ludwigshafen, Germany. Assignor to Badische Anilin und Soda Fabrik, same place. **Black sulphur dye.** From dinitrochlordiparahydroxydiphenyl-*m*-phenylenediamine, sulphur and sodium sulphide. Soluble in concentrated sulphuric acid with a green shade and red-violet in sodium peroxide solution.

688,647. Paul Julius, Ludwigshafen, Germany. Assignor to Badische Anilin und Soda Fabrik, same place. **Brown-red azo dye.** From diazotized chloraminophenolsulpho acid and *b*-naphthol, the dyed shades become blue-black on chroming and carmine-red by treatment with copper sulphate.

688,742. Heinrich Laag, Charles Rutler and Martin Rutler, Dusseldorf, Germany. **Process of dyeing.** Prepares a dye bath in quantity composition and strength sufficient for a piece of goods, supplies the dye gradually to the fabric at the same time moving the latter with increasing velocity through the vat, the level of which rises as the dye is fed in. The process is intended to produce very level dyeing.

688,782. Tho's Hilary, Salem, Mass. Assignor to Koale Save Manufacturing Co., Boston, Mass. **Coal-saving composition.** Made of mineral salt, 2000; copperas, 100; charcoal, 25; saltpeter, 15; and sodium bicarbonate, 15 parts by weight.

688,793 and 794. Both to Edmund C. Rossiter, Langley Green and Horace W. Crowther, West Bromwich, England. Assignors to British Cyanides Co. **Making cyanides,** by heating metallic cyanides or sulphocyanides in the presence of hydrogen, absorbing the sulphur by finely divided metal, and reacting with the hydrocyanic gas on alkali.

Digitized by Google

DECEMBER 17, 1901.

688,813. Jose M. Andira, New York, N. Y. **Insulating compound,** consisting of [illegible]on, 1; hydraulic cement, 2 parts by weight; and milk enough to make a sticky paste.

688,859. Alfred Just, Mannheim, Germany. **Disinfecting cloth.** Saturated with menthol, 10; terpinol, 20; eucalyptol, 20; and creolin, 5 parts by weight.

688,872. Theodore Meyer, Offenbach, Germany. Process of making **sulphuric acid.** In the apparatus of 688,538 the gases are given a circular, spiral, volute motion within a chamber, being introduced at the top and withdrawn at the bottom, and subsequently cooled by contact with the wall of the chamber during an extended path of travel.

688,885. Christopher Ris, Basle, Switzerland. Assignor to Anilin Color and Extract Works (formerly J. R. Geigy & Sons). **Brown sulphur dye.** From a *m*-toluylene diamine and a dicarboxylic acid melted with alkaline polysulphides, soluble in water, concentrated sulphuric acid and alcohol yellow-brown to orange, precipitated by acids in dark brown flocks of free acid, and on reduction with zinc and hydrochloric acid hydrogen sulphide is formed. With sodium sulphide and salt it dyes unmordanted cotton orange-brown, that by oxidation becomes yellowish brown.

688,932. Octave Chanute, Chicago, Ill. **Preserving wood** by treating it with zinc chloride under pressure, then to a vacuum, then to tannin under pressure, then to a vacuum, and finally to a solution of gelatine.

688,966. Heinrich Polikier, Berlin, Germany. Assignor to Aktien Gesellschaft für Aniline Fabrikation, same place. **Blue acid dye.** Tetraalkyldiaminobenzophenone is condensed with alkyl-*m*-tolyl naphthylamine, and sulphonated, forming when dry a blue powder with bronze-like luster soluble in alcohol and water clear blue unchanged by caustic soda or sodium carbonate in small quantity, but on adding an excess blue flakes are precipitated, in concentrated sulphuric acid it forms a red brown solution turning greenish brown, green, and finally blue on dilution with ice water.

688,967. To the same parties. **Blue dye.** From alkyl-*m*-tolyl naphthylamine and tetraalkyldiaminobenzophenone with phosphorus oxychloride, a red-brown powder soluble in alcohol or water blue unchanged by a small amount of sodium carbonate or caustic soda but precipitated by an excess, soluble in concentrated sulphuric acid orange-brown which on dilution with ice water becomes green-brown, green, and finally blue.

688,999. Bernard Heymann, Elberfeld, Germany. Assignor to Farbenfabriken of Elberfeld Co., New York, N. Y. **Process**

Digitized by Google

of dyeing, which consists in treating textile fabrics dyed with sulphur dyes, with alkylating agents.

689,017. William Orr, Salt Lake City, Utah. Assignor to Gold and Silver Extraction Co. of America, Denver, Col. **Regenerating waste cyanide solutions,** which are fouled by the presence of zinc and potassium cyanides by first adding an alkaline hydroxide in quantity sufficient to release the potassium cyanide from the zinc to form an alkaline zincate and a cyanide of the alkali, then agitating and adding a soluble alkaline sulphide in less quantity than necessary to precipitate all of the zinc, and finally removing the resulting zinc sulphide.

689,018. To same parties as above, and a **similar process** applied to residues containing copper with the aid of an electric current.

689,023. Maximilian Riegel, Berlin, Germany. Assignor to the firm of Nahrmittel-Industrie, near Cologne, Germany. **Precipitating casein.** Precipitates the milk by an alkyl-sulphonic acid.

689,025, Friedrich Runkel, Elberfeld, Germany. Assignor to Farbenfabriken of Elberfeld Co., New York, N. Y. **Basic red-violet dye.** Reacts on auramin with derivatives of α-methyl-indol, in which the imido hydrogen is replaced by an alkyl radical. Dark brown powders soluble in water red-violet unchanged by dilute mineral acids, dyeing cotton mordanted with tannin, wool and silk red-violet shades.

689,070. Alexander S. Elmore, London, England. **Separating mineral substances by oil.** Mixes pulverized ore with water, and adds oil in the presence of an acid ; after the mixture is at rest the oil and metallic substance float on top, and are removed and separated by a centrifuge. Adapted for sulfides, tellurides, plumbago or sulphur.

689,129. Alfred G. Salamon, London, England. Assignor to the British Uralite Co., limited, London, England. **Refractory building material.** Makes sheets of asbestos pulp mixed with chalk, impregnates the same with sodium silicate, afterwards acts on the silicate with calcium bicarbonate whereby colloidal silica and calcium carbonate are precipitated within the fabric.

689,149. Wilhelm Weber, Stolberg II, Germany. Assignor to Chemische Fabrik Rhenania, Aachen, Germany. **Compound of pancreas enzymes** with heavy metals, formed by extracting pancreatin with water, adding a salt of the heavy metal to the extract while stirring, then suitably washing the precipitate. When dry, forms light yellow to brown powders.

689,190. Bertram Hunt, San Francisco, Cal. **Recovering precious metals.** Treats pulped ore with a cyanide solution, stirs

Digitized by Google

in metallic aluminum, then adds mercury and continues agitation till an amalgam is formed, finally recovering the precious metal from the amalgam.

689,275. Thomas Barton and Thomas B. McGhie, London, England. **Removing zinc from lead.** The metals are heated to the melting-point, and acted on by fused caustic alkali in the presence of oxygen, whereby a zinciferous product is formed that is separated from the lead.

689,286. Guillaume de Chalmot, Leaksville, N. C. Assignor to Willson Laboratory Company, New York, N. Y. **Making soluble phosphates.** Fuses a mixture of natural phosphates and silica in an electric furnace, removes it as fast as melted, whereby phosphoric anhydride is driven off, and combined with moist calcareous material to calcium phosphate.

689,292. Emile de Meulenmeester, Brussels, Belgium. Assignor to Force Société Anonyme, Antwerp, Belgium. **Process of preserving butter.** Dissolves gum arabic in twice its weight of water, filters and mixes six to ten liters with 100 kilos of butter, and presses out a part of the gum solution, with some of the water the butter originally contained.

689,336. Charles N. Waite, Cranford, N. J. Assignor to Cellulose Products Co., Wilmington, Del. Preparing **viscose,** by treating alkali cellulose with spirts of turpentine and carbon disulphide.

689,337. To same parties as above for treating **viscose** with sodium silicate.

DECEMBER 24, 1901.

689,381. Edgar von Boyen, Hamburg Steinwarder, Germany. Making **mineral wax,** by acting on bituminous brown coal with solvents like benzine or benzene, distilling the product with superheated steam with rarefaction, thereby obtaining a white crystalline mixture of a saturated fatty acid and an unsaturated hydrocarbon, melting at 70° C., partly saponifiable by an alkali, and carbonizing by concentrated sulphuric acid.

689,391. Hans A. Frasch, Hamilton, Canada. Making **nickel salts,** by dissolving ores of copper and nickel in ammonia, adding an alkaline earth, dissolving the hydroxides produced in ammonia which are soluble therein, and precipitating the nickel by sodium chloride.

689,461. Adolf Clemm, Mannheim, Germany. Making **sulphates and chlorine.** Forms a plastic mass of water, clay and chlorides into balls which are dried and heated above the melting-point of the chlorides, while they are treated with sulphurous gas and oxygen. May use sulphuric anhydride.

689,473. Eugene R. Edson, Cleveland, Ohio. Obtaining a

Digitized by Google

gelatine-yielding material from fish, etc. Heats the material in a closed vessel under pressure sufficient to prevent ebullition, and drains off the gelatine.

689,535. Samuel H. Brown, Washington, D. C. Assignor to the American Manufacturing Co. of N. J. **Extracting grease from garbage,** by heating it, saponifying the oils, and then separating them from the saponifying agent and subjecting the residue to a higher degree of heat. The saponified product is separated in a bath of acidulated water.

689,577. Hans von Dahmen, Vienna, Austria. **Blasting agent** of finely divided aluminum, and ammonium nitrate.

689,616. George E. Heyl-Dia, Warrington, England. **Devulcanizing India rubber.** Cuts the scrap rubber in small pieces, dissolves the sulphur out by benzene with the aid of heat not exceeding 120° F., separates the liquid and adds more solvent, then distils off a part, and kneads the remainder in hot water in a closed chamber whereby the rest of the solvent is removed.

689,622. Adolph J. Otto and Thomas J. Brennan, Pawtucket, R. I. Compound for **stopping punctures** in pneumatic tires. Made of aluminum powder, 3; ammonia, 12; plaster-of-Paris, 100; soap, 4; and water added when used sufficient to make a creamy paste.

689,773. Bona Allen and Bona Allen, Jr., Buford, Ga. **Process of tanning.** Put the hides with a difficultly soluble extract of quebracho in a revolving drum with a weak tanning liquor and revolve the drum till the tanning is complete.

689,780. Eduard B. Besemfelder, Charlottenburg, Germany. **Making ammonia from waste.** Distils nitrogenous waste and alumina dry, mixes coke with it and subjects the mixture alternately to air and steam, leads the water gas produced into the first retort, and brings the resulting gas successively in contact with a heated aluminate and alkaline lye to absorb cyanides, carbon dioxide and calcium diphosphate.

689,835. George H. Waterbury, Denver, Colo. Assignor to Frank Williams, same place. Process of **extracting copper.** Leaches the pulverized ore with water and acid, introducing hot air into the tank, draws off the solution and precipitates with iron, also with the aid of hot air blast.

DECEMBER 31, 1901.

689,882. Charles B. Jacobs, East Orange, N. J. Assignor to the United Barium Co., Jersey City, N. J. Process of making a **white pigment,** by mixing solutions in molecular proportions of barium hydroxide and zinc sulphate, thereby obtaining a permanent white of zinc hydroxide and barium sulphate.

689,907. Heinrich Precht, Heustassfurt, Germany. Making

Digitized by Google

potassium magnesium carbonate, by reacting with carbon dioxide on a solution of potassium chloride holding in suspension magnesium carbonate containing three molecules of water of crystallization.

689,926. Eugene B. Smart, Florence, Colo. Making **sodium amalgam.** Heats paraffin to the melting-point of an alkali metal, adds the metal which as melted is covered by the paraffin, then adds mercury 53 parts to 1, decants the paraffin, and stirs the amalgam till cold.

689,959. Edward L. Graham, Upper Warrington, England. **Disintegrating ores,** by immersing them in a solution of sulphuric acid to which fluorspar has been added, then passing an electric current through, which disintegrates the undissolved ore and scatters it through the solution, finally extracting the metal from the ore.

690,048. Lewis Cheeseman, Sr., Alexandria, Va. Assignor to A. H. Agnew and Park Agnew, same place. The process of **treating natural phosphates,** in a finely divided state with water and an acid salt which will change tribasic phosphate to mono or dibasic or both, passing through the mixture a current of electricity and evaporating the water.

690,049. To same parties as above. Making **water-soluble phosphates.** Pulverizes the rock, mixes with dilute sulphuric acid only sufficient to convert the carbonates and fluorides present, then adds acid sodium sulphate, and dries.

690,062. Rudolph Knietsch, Ludwigshafen, Germany. Assignor to Badische Anilin und Soda Fabrik, same place. Making **sulphuric anhydride,** by passing a gas containing sulphur dioxide and oxygen through a contact substance while removing excess of heat due to the reaction by a different fluid flowing in an inverse direction.

690,080. Otto Schutz and George Dallmann, Gummersbach, Germany. Making **urea quinate.** Mixes solutions of one molecule of quinic acid and two molecules of urea below 70° C., then heating the mixture under reduced pressure at a temperature below 55° C.

690,126. George Weddell, Newcastle-upon-Tyne, England. Process of **making table salt,** by mixing with finely powdered common salt a sodium salt of an oxygen acid, triturating and heating the mixture whereby the salt is rendered less deliquescent.

690,133. Adolph Clemm and Wilhelm Hasenbach, Mannheim, Germany. Making **sulphuric anhydride.** Roaster gases are passed over ferric oxide, the sulphuric anhydride formed is re-

Digitized by Google

moved, then heating the rest of the gases and passing them over a platinum contact substance to convert them into anhydride.

690,141. Wilhelm Gintl, Aussegg, Austria-Hungary. Continuous **electrolysis of alkali chlorides.** Feeds the electrolyte gradually into a chamber above the anode keeping it at constant level, and at the same time drawing it through a partition to the cathode chamber below the anode while maintaining the current.

690,211. Charles N. Waite, Cranford, N. J. Making **cellulose films** tough and flexible by impregnating the cellulose compound with lactic acid. The compound may be an ester of nitric or acetic acid.

690,250. Warren A. Durren, Woodville, Wis. Making **fabrics waterproof and air-tight,** by treating unsized fabric to a bath of potters' clay, rye flour and wood pulp, drying and surfacing the fabric with melted paraffin.

690,257. Edgar Everhart, Atlanta, Ga. Assignor to Piedmont Chemical Co., Portland, Me. **Making alum** by adding bauxite to a solution of niter cake, heating the mixture to form sodium sulphate and soda alum, adding water and an alkali, drawing off the liquor, crystallizing the Glauber salts, draining off the solution of soda alum, heating the same, adding potassium chloride, and crystallizing the product.

690,271. Richard O. F. Hailer, Ludwigshafen, Germany. Assignor to Badische Anilin und Soda Fabrik, same place. **Brown sulphur dye,** from hexanitrodiphenylamine, sodium sulphide and sulphur, precipitated as brown flocks from a water solution by ammonium chloride, adapted to diazotize on the fiber and couple with β-naphthol.

690,279. Gottlieb Heilenman, Louisville, Ky. **Yeast,** of cornmeal 24, potato flour 4, and 1 part each of sodium bicarbonate, salt, sugar and anise flour.

690,292. Max H. Isler, Mannheim, Germany. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. **Violet anthraquinone wool dye.** From halogen-hexahydroxymethyl anthraquinone and primary aromatic amines, sulphonated, soluble in anilin blue, in alcohol violet, in sulphuric acid blue-green, reddening on adding boracic acid.

699,294. Paul Julius, Ludwigshafen, Germany. Assignor to Badische Anilin und Soda Fabrik, same place. **Red carbon dye lake.** From a diazotized heteronuclear monosulpho acid of β-naphthylamine, and β-naphthol, which on suitable treatment with a reducing agent regenerates its constituents except that the amino group unites with the naphthol.

690,295. Carl Kellner, Vienna, Austria-Hungary. **Extracting zinc.** Treats roasted zinc sulphide ores with sulphurous acid

Digitized by Google

gas to form bisulfite that is at once converted to monosulphite, which is oxidized to a sulphate, which is further acted on by the chloride of an alkaline metal or alkaline earth, the zinc chloride being liberated by a carbonate and the sulphur dioxide returned into the cycle of work.

690,325. Paul Seidel, Ludwigshafen, Germany. Assignor to the Badische Anilin und Soda Fabrik, same place. Acid salt of **phenylglycocol-o-carboxylic acid.** Anthranilic acid and chloracetic acid react on each other in aqueous solution in the form of neutral salts, the product is difficultly soluble in cold water, more easily in hot, from which it crystallizes almost colorless.

690,332. Daniel Vorlander and Bruno Drescher, Halle-on-Saale, Germany. Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. **Acylated indoxylic acid,** from indoxylic acid and acetic anhydride, soluble in alcohol and ether; the first solution turns red on adding ferric chloride; on heating with caustic soda and oxidizing, the acid yields indigo.

690,346. Fritz Bender, Frankfort-on-Main, Germany. Assignor to Farbwerk Muhlheim, Muhlheim, Germany. **Acetylphenylglycocol-o-carboxylic acid.** Reacts with acetic anhydride on a salt of phenylglycocol-*o*-carboxylic acid in the presence of an alkali.

690,347. Wilhelm Berns, Ludwigshafen, Germany. Assignor to Badische Anilin und Soda Fabrik, same place. **Discharging indigo dyed wool.** Prints the goods with a discharge, steams and then bleaches them to clear the whites. W. H. SEAMAN.

Digitized by Google

REVIEW OF AMERICAN CHEMICAL RESEARCH.

VOL. VIII. No. 7.

WILLIAM A. NOYES, Editor.

REVIEWERS:

M. T. Bogert, E. M. Chamot, B. S. Cushman,
Benton Dales, L. M. Dennis, A. H. Gill,
H. M. Goodwin, W. F. Hillebrand, L. P. Kinnicutt,
H. W. Lawson, H. N. McCoy, A. A. Noyes,
J. W. Richards, S. P. Sadtler, J. O. Schlotterbeck,
W. H. Seaman, F. P. Underhill.

INORGANIC CHEMISTRY.

The Sulphates of Bismuth. BY F. B. ALLAN. *Am. Chem. J.*, 27, 284–288.—In this research acid bismuth sulphate or the basic salt prepared by stirring the acid sulphate with 10 per cent. sulphuric acid, was stirred with sulphuric acid solution of different concentrations till equilibrium was reached. When the liquid contained little sulphuric acid, the composition of the solid phase was deduced from the change in the liquid, but the solids in equilibrium with the stronger acid solutions were analyzed directly, after being rubbed between porous plates. The acid sulphate $Bi_2O_3.4SO_3$, (with 1, 3, 7 or $10H_2O$) was found to be in equilibrium with sulphuric acid of from 51.4 to 100 per cent. When the strength of the acid was less than 51.4 per cent. and greater than 5.4 per cent. the solid phase consisted of the salt $Bi_2O_3.2SO_3.2^1/_2H_2O$, while that in equilibrium with all strengths of acid less than 5.4 per cent. was $Bi_2O_3.SO_3$. This last salt is not acted on by water at 50°. H. N. McCOY.

On Some Double Sulphates of Thallic Thallium and Caesium. BY JAMES LOCKE. *Am. Chem. J.*, 27, 280–284.—Contrary to the statement sometimes found in handbooks, trivalent thallium does not seem to be able to form alums. As caesium yields alums more readily than any of the other univalent metals, attempts were made to obtain a caesium-thallium alum. But by crystallization of the two sulphates under the most varied conditions, from both hot and cold solutions, no isometric alum could be obtained. A double salt, $CsTl(SO_4)_2.3H_2O$, crystallizing in small prisms, and another, probably $CsTl(SO_4)_2 1^1/_2H_2O$, rhombic plates, were isolated. H. N. McCOY.

Digitized by Google

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

On the Occurrence of Aplite, Pegmatite, and Tourmaline Bunches in the Stone Mountain Granite of Georgia. By THOMAS L. WATSON. *J. Geol.*, 10, 186–193.—True aplites have been observed in connection with granitic masses in Georgia only at Stone Mountain, where several narrow dikes are exposed in quarries on the northwest side. Pegmatities are common, not only at Stone Mountain but also elsewhere. Sometimes they are practically pure quartz, but usually are granitic, and then at Stone Mountain "the dark minerals, mica, tourmaline, garnet, are frequently concentrated along the central axis of the dike or vein." There too, the principal aplite "is banded with pegmatite, the aplite forming the border next the granite and the pegmatite the middle layer of the dike." The aplite is marble-white as compared with the granite, and what little mica it contains is muscovite. From chemical analyses of the granite by Packard and of the enclosed aplite by Watson, which shows close agreement in most respects, it is calculated that in the aplite oligoclase> quartz> orthoclase and microcline> muscovite, and that in the granite this same order obtains except that the potash feldspars are slightly in excess of the quartz. To emphasize the grouping of aplites into potash aplites, soda aplites, and those with about equal percentages of the alkalies, comparative analyses of aplites from other sources are given.

Noteworthy throughout apparently the entire mass "of the Stone Mountain granite is the somewhat abundant occurrence of small areas of aggregated black tourmaline crystals..... The occurrence of the mineral is not that of a characterizing accessory, as has been noted in some granites,..... but is more after the order of segregations in the biotite-bearing muscovite granite." These tourmalines always occupy the center of perfectly white areas of quartz and feldspar free from muscovite and biotite. It is concluded that the mineral must have resulted from fumarolic action on feldspars and mica of vapors charged with boric acid.

W. F. HILLEBRAND.

Coal of Michigan, Its Mode of Occurrence and Quality. By ALFRED C. LANE. *Geol. Survey of Michigan, Vol. 8, Part II*, 232 pp.—After a brief introduction follow chapters on the origin and occurrence, analyses and tests, erosion and disturbance, and development of coals, and on the developments and borings arranged by counties. Detailed investigation and tests warrant the assertion that, contrary to too prevalent opinion, Michigan coal is not "all of the same quality and that poor." A series of analyses and tests by H. J. Williams shows that for the Michigan coals certain relations hold approximately between heating power

Digitized by Google

and analysis. Numerous analyses and calorimetric tests were made by a number of chemists and are discussed at considerable length as well as the methods and apparatus employed. From one series of analyses it appears that the sulphur driven off on burning and the iron are throughout in such close agreement with the pyritic ratio that the simpler iron assay might be substituted for the more difficult sulphur test. The Michigan coals are bituminous. W. F. HILLEBRAND.

Notes on Unusual Minerals from the Pacific States. By H. W. TURNER. *Am. J. Sci.*, 13, 343–346.—The following minerals are mentioned: *Pyromorphite*, from Mosquito Gulch, near Placerville, California, not heretofore reported from the Pacific slope. *Monazite*, from Idaho, already reported by Lindgren. *Apatite*, separated from an Archean (?) gneiss taken from the North Fork of the Mokelumne river, California, which according to qualitative tests by the reviewer seems to be free from fluorine and hydroxyl and to carry but little chlorine. *Vivianite*, from Los Angeles County, California, already noted by H. G. Hanks. *Chloropal*, *Pyroxene* near *Diopside*, *Vesuvianite* free from boron, all from Esmeralda County, Nevada, with analyses of each by Steiger. *Jarosite*, from Esmeralda County, Nevada, in which the potassium is replaced by sodium (Hillebrand). [This and other members of the jarosite-alunite group will form the subject of a paper by S. L. Penfield and the reviewer.] *Gersdorffite* and *genthite*, from near Candelaria, Nevada, identified by E. T. Allen, of the Geological Survey. W. F. HILLEBRAND.

Ann. New York Acad. Sci., 14, Part II.—This volume contains summaries of numerous papers of which the following may be mentioned:

The Granite of Barre, Vermont. By George I. Finlay, p. 101.

Note on a Sand Fulgurite from Poland. By A. A. Julien, p. 102.—This fulgurite offers the first observed instance of devitrification, also other new features.

A Method of Facilitating Photography of Fossils. By Gilbert van Ingen, pp. 115–116.—By coating the specimens with ammonium chloride a surface is obtained "which effectually illuminates under the influence of both color and reflected light. The necessary articles for construction of the apparatus are: a foot blower, large wide-mouthed bottle of gallon capacity, with three holed rubber stopper, two bottles of quart capacity, each with two-holed rubber stopper, glass tubing of one-eighth inch bore and rubber tubing to fit same (three feet of each), two U-shaped calcium chloride tubes filled with chloride, strong ammonia water, strong hydrochloric acid. To use: Air from the foot blower is forced into the large bottle, which equalizes the pressure, and

Digitized by Google

thence through the ammonia water and hydrochloric acid into the smaller bottles. The air, mixed with the gases taken up, is passed through the calcium chloride tubes, where the moisture is extracted, and escapes from the glass tubes held in the hands at a short distance from the object to be coated. The union of the two gases escaping from the tubes forms ammonium chloride, which settles as an exceedingly fine powder upon the surface of the specimens. The coating thus obtained, when deposited slowly, is of a dead white, which effectually hides all coloration of the surface, and, instead of obliterating the finer modeling, renders the details of the topography with the utmost distinctness." On its face this process seems to be quite different from that patented by H. S. Williams (Claim 640,660, *Official Gazette*, **89**, 2602) in which *sublimation* is used to produce the coating material. [The process should be useful for photographing other delicate surfaces than those of fossils].

New Asbestos Region in Northern Vermont. By J. F. Kemp, p. 140.—In the adjacent towns of Eden and Lowell in Lamoille and Orleans counties, respectively, asbestos has recently been opened up in commercial quantities. It is, as usual, found in serpentine (which seems to have been derived from enstatite) "either in veins or in matted aggregates along slickensided blocks." The fiber is fine and silky, up to three-quarters inch in length, which would make it of second grade according to Canadian practice.

Notes on the Geology of the Saline Basins of Central New Mexico. By D. W. Johnson, pp. 161–162.—See Abstract, **24**, 151, under another title.

The Grain of Igneous Rocks. By A. J. Queneau, p. 163.—A general observation is that near the margin of an intrusive dike the rock is dense, often glassy, without any appreciable grain, whereas the grain begins to grow coarse according to some definite law, progressively as the distance from the wall increases. From a study of the subject the following laws are deduced: (1) "The zone of varying grain will vary indirectly as the initial temperature. From this follows that (*a*) Plutonic rocks very deeply seated will not present a zone of varying grain to any extent. (*b*) Rocks which come to rest at a temperature nearing their consolidation point will present a wide zone of varying grain. (2) The time of cooling, other conditions being the same, varies as the square of the thickness of the dike. From this last law it is assumed that the size of the crystals vary as the square of their distances from the nearest margin; then the square root of their area which can be measured varies directly as the distances from the margin. Thus we have a simple law of easy application." W. F. HILLEBRAND.

Digitized by Google

METALLURGICAL CHEMISTRY.

The Mineral Output of the World. *Iron Age*, March 20, 1902.—From report of C. Le Neve Foster to the Home Office, British Government. Some of the most important data are abstracted in this article, such as those of coal, copper, gold, iron, lead, silver, tin, zinc, and petroleum. The United States produced of the total, in 1900, 33 per cent. of the coal, 51 per cent. of the copper, 30 per cent. of the gold, 35 per cent. of the iron, 31 per cent. of the lead, 32 per cent. of the silver, 25 per cent. of the zinc, and 40 per cent. of the petroleum.

J. W. RICHARDS.

The Mineral Production of Canada. *Eng. Min. J.*, March 15, 1902.—E. D. Ingall, of the Geological Survey, has compiled the production for 1901. The total value is $69,400,000, of which 35 per cent. is gold, 23 per cent. coal and coke, 10 per cent. copper, 7 per cent. building material, 6.6 per cent. nickel, 4.3 per cent. silver, 3.2 per cent. lead, 1.75 per cent. pig iron, 1.7 per cent. asbestos, 1.4 per cent. petroleum, and 0.9 per cent. cement. Nickel production was 9,189,000 pounds, an increase of 30 per cent. over 1900. Copper was 40,950,000 pounds, an increase of 115 per cent.

J. W. RICHARDS.

The Capacity of Our Iron and Steel Works. J. M. SWANK. *Iron Age*, March 6, 1902.—From *Directory of the Iron and Steel Works of the U. S. Blast-Furnaces.*—These number 406, completed furnaces, of which about 400 may be counted as workable. Their annual capacity is 24,000,000 gross tons of pig iron. *Rolling Mills and Steel Works.*—There are 527 completed, 28 in course of erection and 1 being rebuilt, total 556. There are 6 more projected. *Puddling Furnaces.*—Counting each double furnace as two single furnaces, there are 3251 single furnaces. In 1898 there were 3889, and in 1884 the maximum number 5265. *Bessemer Steel Works.*—There are 35 Bessemer works with 81 converters, one Clapp-Griffith plant, with one converter, two Robert-Bessemer plants with 3 converters, nine Tropenas and special Bessemer plants with 15 converters, total 47 plants with 100 converters: capacity 13,000,000 tons yearly. *Open-Hearth Steel Works.*—There are 112 completed plants with 403 furnaces; 12 plants are building, with 40 furnaces; 13 plants are projected. Annual capacity of plants finished and building 8,289,750 gross tons. Of the 403 furnaces, 167 are acid-, and 236 basic-lined, with capacities of 1,874,650, and 6,415,100 gross tons yearly, respectively. *Crucible Steel Works.*—There are 45 plants, 3 building, and 1 projected. The number of pots in operation is 2,896, annual capacity 175,000 tons. *Steel Castings.*—There are 56 plants, mostly open-hearth, some small Bessemer and 14 crucible plants. *Rail Mills.*—There are 45, and 3 building. *Structural*

Digitized by Google

Mills.—There are 67. *Plate, Sheet and Skelp Mills.*—There are 223 plants, 13 building and 2 more projected.

J. W. RICHARDS.

The Briquetting of Fuels and Fine Mineral Ores. By W. G. IRWIN. *Eng. Mag.*, March, 1902. The briquetting industry of Europe is still almost entirely applied to mineral fuels, but in the United States it is being used not only for coal and coal dusts, lignite and other mineral fuels, but also for fine ores and flue dusts and precious mineral ores. Since 1837, over 100 patents concerning briquetting have been issued in the United States, and the more recent ones are of a distinctively American type. From 1868 to 1895 numerous experimental plants attempted unsuccessfully to briquette coals, but much valuable experience was gained. Since 1895, the machinery has been much improved. In 1896, White attempted to adapt the brick press to this purpose, and since 1899 has had it in successful operation, machines with a capacity of 100 tons of ore or flue dust per ten hours being operated. In briquetting minerals, lime is used as a binder. The Belgium Mineral Press is used in connection with the Gardner–Corning briquetting process. The coal is reduced to pulp, heated to 180°–200° F. and cemented by the warm binding material without altering the chemical combustion of the coal or the binder. It is pressed at 5 tons to the square inch, and comes from the press warm but solid. At Stockton, Cal., coal dust is briquetted with petroleum. Many smelters in the West are now briquetting their flue dusts and slimes, and saving 10 to 20 per cent. of their ore. With the improved mineral presses the bricks are now made so hard that there is no trouble with their crumbling, and in one instance they are dropped seven feet from the press into the car, without being damaged. Many iron plants are briquetting fine iron ore at a total cost of less than $1.00 per ton. Large blast furnaces will produce 40 to 50 tons of such fines and flue dust daily, often causing explosions. Present conditions involve either the abandonment of the monster modern blast-furnaces or the adoption of briquetting as a relief.

J. W. RICHARDS.

A Briquette Plant in New Mexico. *Eng. Min. J.*, March 1, 1902.—The Colorado Fuel Iron Co. are building a 400-ton plant at Gallup, N. M., to utilize the screenings from their coal mine. The briquettes are in 3-inch cubes, and are in considerable demand.

J. W. RICHARDS.

Arkansas Anthracite Coal. *Age of Steel*, March 1, 1902.—The center of operations is Spadra, Johnson County. The appearance and structure of the coal resembles that of the Lykens Valley field in Pennsylvania. Analyses show 5 to 10 per cent. of ash, 6 to 12 per cent of volatile combustible matter, and 80 to 85 per cent of fixed carbon. The annual shipments are 50,000 tons,

Digitized by Google

but is rapidly increasing, and the demand in Missouri, Kansas and Nebraska will easily absorb 150,000 to 200,000 tons.

J. W. RICHARDS.

Improved Blowers for Gas Producers. *Iron Age*, March 6, 1902.—A record of tests made by the Bethlehem Steel Co., Pennsylvania Steel Co., and the Pencoyd Iron Co., comparing the Eynon-Evans blower with the ordinary steam blower used on gas producers. The Bethlehem Steel Co's test showed the Eynon-Evans blower to consume 79.3 per cent. less steam, blowed 39.8 per cent. less air and obtained 18 per cent. less pressure, while the gas produced was of much better quality. Tests at the Midvale Steel Works showed the Eynon-Evans blower to be about three times as efficient as the Wellman blower. By using such powerful blast, three to six feet of fuel can be carried in the producer, and correspondingly better gas obtained.

J. W. RICHARDS.

Ore Handling at Furnaces. BY W. FAWCETT. *Sci. Am.*, March 8, 1902. A finely illustrated article describing the stock yards, hoisting apparatus and headgear of a modern blast-furnace. The traveling bridge tramways, of as much as 260 feet span, electrically driven, and conveying at high speed buckets of over a ton capacity, will handle ore from railway car to ore pit, or from ore pits to bins, at an average cost of less than 1 cent per ton. These bridges travel 50 feet a minute, driven by two 130 H.P. motors. The car dumper picks the railway car up bodily and dumps its contents into four small steel cars of 17 tons' capacity each of the side dump pattern. These cars are drawn up into the traveling bridge, and dumped at any point on the stock pile desired. For rehandling the ore to the bins, a supplementary track is suspended below the chords of the bridge, on which runs a trolley carrying an automatic bucket of 10 tons' capacity. This is filled by dragging it up the stock pile, and is then lifted onto the end of the bridge overhanging the bins, and dropped therein. Another important mechanical adjunct is the furnace hoist, consisting of inclined rails terminating in the extension framework on top of the furnace. The skip car of 1 to 3 tons' capacity is hoisted up, but when near the top the narrow tread front wheels of the skip car incline downwards toward the hopper, while the broad tread wheels in the rear incline upwards, thus automatically dumping the contents into the hopper. A stock distributor distributes the charge uniformly. Thus top fillers are dispensed with, and the charging is done by one man at the engine at the base of the hoist. Other devices are automatic stock registers to indicate the level of stock in the furnace. All the work of hoisting stock and filling the largest furnaces is attended to by one man.

J. W. RICHARDS.

Digitized by Google

Notes on Tuyeres. By J. HARTMAN. *Iron Age*, February 21, 1901.—Gives illustration of a bronze tuyere returned to the maker as imperfect, but really spoiled by carelessness of the furnace men in not keeping the tuyere open by liberal use of the pricker rod. A good tuyere will run a year, with proper care, but may be burnt at the nose in an hour, if not properly watched. Zinc or lead in the ores alloys with the bronze and melts off the nose of the tuyere quickly. Twenty-five years' practice has led the writer to state that the velocity of the entering air must be 10,000 feet per minute for a charcoal furnace, 15,000 feet for a coke furnace, and 20,000 feet for an anthracite iron blast-furnace. With the rapid driving of furnaces as at present, the greatest care and watchfulness of the tuyeres is imperative with a well-used pricker rod always at hand. J. W. RICHARDS.

A New Mill for Rerolling Rails. *Iron Age*, March 20, 1902. From the *R. R. Gaz.*—A third mill has been erected at Tremley Point, N. J., by the American McKenna Process Company, to re-roll old steel rails. It will have a capacity of 600 tons daily, on double turn. The chief difficulty is the uniform heating of the rail, and this is accomplished by standing it on its flange on the bed of the furnace and heating the heads directly by the flame. The floor retards the heating of the thin flanges, and very uniform heating is thus obtained. The rails are drawn at 1800° F. and finished at 1200° F., which is considerably lower than in usual rail-mill practice. The loss in furnace and crop-ends is about 8 per cent. The re-rolling makes the rails tougher, more elastic and durable. J. W. RICHARDS.

Improvements of the Crucible Steel Company of America. *Iron Age*, March 20, 1902.—This company controls 95 per cent. of the crucible steel output of this country. It has organized the St. Clair Steel Company at Clairton, Pa., to furnish it with raw material and open-hearth bars and plates. The plant consists of twelve 50-ton furnaces. They have also organized the St. Clair Furnace Company, to make pig iron, with three 450-ton blast-furnaces, which are considered the most suitable size furnaces for best results on Mesaba ore. The company has acquired the exclusive use for this country of the Bertrand-Thiel process.
J. W. RICHARDS.

The Bertrand-Thiel Process. By J. W. CABOT. *Iron Age*, May 2, 1901.—A study of the process as carried out at the works where it originated. The fluid iron from the blast-furnace was charged in the refiner with 7 per cent. of quicklime, followed by 16 per cent. of ore, followed by a second ladle of iron, making the whole charge 15 tons. The pig iron contained 3.70 carbon, 1.35 phosphorus, 0.90 silicon, 0.40 manganese, 0.05 sulphur. The bath boiled in the refiner two hours, during which 90 per cent. of its phosphorus and 95 per cent. of its silicon were removed,

Digitized by Google

while over two-thirds of the carbon remained. Meanwhile the finishing furnace was brought up to heat, containing $3^1/_2$ per cent. of lump lime, 7 per cent. of ore and 7 per cent. of scrap, and the refined metal was tapped into it, the slag being skimmed from it *en route*. After boiling $2^1/_2$ hours the phosphorus was down to 0.01, and the bath was ready for tapping. Very complete analyses are given of the metal at various stages of the process.

J. W. RICHARDS.

Foundry Economy. BY R. MOLDENKE. *Iron Age*, March 27, 1902. Read before the *Foundryman's Association*.—Buying pig iron on analysis has rapidly spread among the foundries. The piling, grading and stocking of pig irons is an important factor. There are still grades of strong and weak iron which analyze the same, and these must be kept piled separately; their differences are probably due to oxidation, but to a degree not traceable with certainty by chemical means. The arrangement of the piles is largely according to their silicon content. Scrap should be carefully sorted according to its probable composition; 25 to 40 per cent. of scrap is averaged in good charging, 60 per cent. is the maximum. The writer once, in an emergency, used 97 per cent. of scrap, with 3 per cent. of silicospiegel containing 24 per cent. of manganese, and 18 per cent. of silicon, and made good castings. By knowing what is in the pig iron and what in the scrap, and what the castings should contain, the wide-awake foundryman can calculate his charge with certainty. J. W. RICHARDS.

Centrifugal Casting. BY A. E. FAY. *Iron Age*, February 28, 1901.—Sewicki's article in the *Z. des V. Deutscher Ing.*, June 25, 1898, describes only Huth's machine, but omits several meritorious inventors. A. G. Eckhardt, of Soho, England, first patented the idea in 1809. T. G. Lovegrove, of Baltimore, patented a device for the same purpose, in America, in 1848. These were the pioneer inventors. The subsequent inventions may be grouped into four classes, *viz.*, these in which the mold rotates (1) in a vertical position about a vertical axis, (2) in a horizontal position about a horizontal axis, (3) in a horizontal position about a vertical axis, or *vice versa*, (4) in two directions about two central axes. Sir Henry Bessemer devised a machine on this principle, to extricate the gases from the molten metal. The machines of Deeming, Sebenius are described at length and illustrated, and many others explained. J. W. RICHARDS.

Electrolytic Recovery of Copper from Low-Grade Ores. BY N. S. KEITH. *Elec. Rev.*, March 22, 1902. Read before *Am. Inst. Elec. Eng.*, February 28, 1902.—The ore is powdered and roasted, then the copper dissolved by sulphuric acid of 5 to 15 per cent. strength, in tanks holding 125 to 150 tons of roasted ore, and having a false bottom with filtering canvas. The leaching is methodic. The solution then runs through depositing vats

Digitized by Google

in series, in which the deposition is methodic, that is, the area of depositing plates progressively increases as the solution becomes exhausted, thus allowing a more uniform deposition of pure copper. The electrodes are both sheet lead; the deposited copper is stripped from the cathodes; the anodes become coated with lead dioxide, and are then no further attacked. The solution becomes acid, and is used over for dissolving roasted ore.

J. W. RICHARDS.

Anaconda Copper Mining Company's New Reduction Works. *Eng. Min. J.*, March 1, 1902.—These are, without doubt, the largest, most complete and most modern works of their kind in the world. Mr. Frank Klepetko is the designer of the plant. Ground was first broken nineteen months ago. The site is on a hillside, covers 300 acres, and consists of nine departments, which are briefly as follows: (1) *Concentrator with Ore-bins and Storage bins.*—The ore is brought thirty-five miles from Butte. The ore-bins are 70 feet high, 24 feet wide and 650 feet long. The concentrator building covers seven acres, and is in two parts, each 255 feet by 335 feet, with power-house between. There are eight sections to it, each capable of treating 600 tons of ore in twenty-four hours. Each section has a 24 x 12 inch Blake crusher, Evans jigs, Evans hydraulic classifiers, Huntington mills and thirty-five Wilfley tables. (2) *Concentrator Power-House.*—This contains two 2,000 H. P. triple-expansion Nordberg engines, and one Fraser and Chalmers 1400 H. P. (3) *Sampling Department.*—This is in two sections, each with a capacity of 600 tons per twenty-four hours. Twenty per cent. of the ore is taken each time, and reground between sampling, until the final sample from the last Brunton sampler is 3.2 pounds per ton of sampled ores. (4) *Roaster Department.*—This is a steel structure 98 feet wide, 320 feet long and 50 feet high, containing forty-eight improved MacDougal roasters, each 28 feet high with six roasting hearths. Each can roast 40 tons per twenty-four hours. The roasting is automatic, no fuel is required after the furnaces are once started, the sulphur furnishing the necessary heat. The fumes pass through a dust chamber 40 feet wide, 40 feet high and 300 feet long, covered with expanded metal and concrete, and pass to a chimney 24 feet in diameter and 230 feet high. (5) *Reverberatory Department.*—This building is of steel, and is 184 feet wide by 518 feet long. It contains fourteen furnaces, each 24 feet wide by 54 feet long, in two rows. The smelting capacity of these furnaces is 120 tons in twenty-four hours; the matte is tapped into 20-ton ladle cars and taken to the converters. The slag is granulated by running into water and carried off in sluices to the dump. The stack is of similar size to that of the roasting department. (6) *Blast-Furnace Department.*—This building is 82 feet wide by 200 feet long, and has three stories, the first being

Digitized by Google

the matte track floor, the second the main operating floor, and the third the charging floor. There are five furnaces, each 56 inches wide, 180 inches long, about 40 feet high, and each capable of smelting 400 tons in twenty-four hours. (7) *Converting Department.*—This is 137 feet wide, 416 feet long, and fitted with two 60-ton, one 40-ton and one 20-ton electric traveling cranes. There are two reverberatory storage furnaces, eight converters, three casting furnaces with special casting machines for casting anodes or pigs, two slag casting machines. The converters are of the barrel type 8 feet in diameter by 13 feet long, with eighteen $1^1/_4$-inch tuyeres. The slag is cast into small bricks, which are returned to the blast-furnaces. (8) *Smelter Power-House.*—This is 80 feet wide, 500 feet long, and contains four Nordberg compound engines directly connected to No. 10 Connelsville blowers, each furnishing 30,000 cubic feet of air per minute at 30 ounces' pressure; also one Nordberg triple-expansion engine with a compressor furnishing 20,000 cubic feet of air per minute for the converters, at 13 pounds' pressure per square inch. Stirling water-tube boilers furnish the steam. (9) *Briquetting Department.*—This has two machines with a capacity of 100 tons in ten hours, to treat sluice fines and flue dust. *Conclusion.*—There were used in the construction of this mammoth plant 20,000 tons of structural steel, 25,000,000 feet of lumber, 1,000 cars of brick, 50,000 yards of masonry, and about 300,000 yards of excavation were made. J. W. RICHARDS.

Electricity in Mining. By G. H. GIBSON. *Eng. Min. J.*, March 1, 1902.—Besides the applications of electricity to hauling, etc., in mines, this article contains interesting descriptions of its application to metal refining and reduction work. The largest cyanide gold reduction plant in the world, the Golden Gate Mill of the De la Mar's Mercur Mines Co., is supplied with electric power from Provo, Utah, 30 miles distant.

J. W. RICHARDS.

Zinc Production of the World. *Eng. Min. J.*, March 22, 1902.—Merton and Co. estimate the total for 1901 as 498,590 long tons, of which the United States produced 122,830 tons, or 24.6 per cent. The Rhine, Belgium, and Holland produced 199,285 tons, or 40 per cent.; and Silesia 106,385 tons, or 21.5 per cent. J. W. RICHARDS.

The Osceola, Nevada, Tungsten Deposits. By F. D. SMITH. *Eng. Min. J.*, March 1, 1902.—The writer examined the deposits in December, 1901. The ore is "hübnerite," in veins in granite. The walls are well defined and part easily, the vein being separated from the foot-wall by a foot of clay. The width is 18 to 36 inches, and averages 26 inches. Crystals of hübnerite are found, but much is in fine grains and irregular bodies in white quartz. In one locality much scheelite was found but the ore as a whole

Digitized by Google

is very free from other minerals. The ore is hand-sorted and cobbed, and averages, as shipped, 68 per cent. tungstic acid. The writer believes the whole vein will produce 10 per cent. of ore, carrying 70 per cent. of tungstic acid. The mine is quite accessible, for Nevada, and is 85 miles from the railway, at Frisco, Utah. It was first discovered in 1885, but not worked until 1899. Ten tons of ore were shipped in 1900. J. W. RICHARDS.

Rutile Mining in Virginia. BY G. P. MERRILL. *Eng. Min. J.*, March 8, 1902.—Read before the Geological Society of Washington. The possibility of the use of titanium in cast-iron or steel gives interest to the source of supply of titanium ores. Rutile is now quoted at $350 to $450 per ton. The deposit is on the Tye River near Roseland, Nelson County; the rutile is in granules 2 to 3 mm. in diameter disseminated in feldspar or quartz, and occurs up to 25 per cent. of the mass of the rock. The ore is shipped to Charlotte, concentrated there, and now shipped abroad. The property is owned by the American Rutile Company of Washington, D. C. J. W. RICHARDS.

Quicksilver Production of the World. *Eng. Min. J.*, March 22, 1902.—The total is 3,335 metric tons, of which the United States produced 992, Spain 846, Austria, 512, Russia 368, Mexico 335, and Italy 278. The production decreased about 7 per cent. in Austria and 23.9 per cent. in Spain, but increased 8 per cent. in Russia, 26.4 per cent. in Italy, and 2.6 per cent. in the United States. J. W. RICHARDS.

The Sudbury Nickel District. *Eng. Min. J.*, March 22, 1902.—The recent transfer of the stock of the Canadian Copper Co. to the American Nickel Co., which latter includes Col. R. M. Thompson, Chas. M. Schwab, E. C. Converse and Joseph Wharton, for about $9,000,000, gives to the latter company one of the most valuable mining estates in America. The Mond Nickel Company continues independently. A fine body of ore has been opened in their Denison mine. The Lake Superior Power Co. has purchased three mines in the Creighton District, and is building a 3-furnace smelting plant with a capacity of 300 tons a day. There is every prospect of great activity and interest in the nickel industry. J. W. RICHARDS.

Plaster of Paris as a Brass Founder's Flux. BY E. S. SPERRY. *Al. World*, March, 1902.—In melting nickel or German-silver there is no better flux than borax, but it is useless in melting brass; likewise fluorspar is used in the iron foundry but is unsuited in the brass industry. Glass is even worse for brass than borax. Salt does not form a fluid slag, and gives off choking fumes. Soda-ash and sand attack the crucible. Plaster of Paris is cheap, melts easily, gives off no obnoxious fumes, has a low specific gravity, and the small amount of sulphurous fumes it

Digitized by Google

gives off appears to have no harmful influence on the metal. For melting down washings, skimmings, buffings or grindings, it is most advantageously used. Add 4 or 5 pounds to 100 pounds of metal, before the metal begins to melt, best before putting into the crucible. The flux is poured off with the metal. It separates easily from the ingots, and may be used over several times. It appears to have no action on the crucible.

J. W. RICHARDS.

The Electrochemical Industries. By S. SHELDON. *Elec. Rev.*, March 8, 1902.—Read before *Am. Inst. Elec. Eng.*, February 28, 1902.—Discusses the electroplating of gold, silver, nickel and brass, and the influence of current density, circulation and dissociants present on the deposit. The refining of copper, parting of gold and silver, extraction of gold from its ores, and the extraction of nickel by the Hoepfner process are next described. Then is taken up the production of alkalies and bleach, metallic sodium, aluminum, spongy lead, potassium chlorate, ozone, and nitric acid from the atmosphere. Among organic products are described the production of iodoform, chloroform, bromoform, camphor, and vanillin. In the line of electric furnace products the writer describes the production of calcium carbide, carborundum, artificial graphite, barium hydroxide, barium cyanide, phosphorus, corundum, iron alloys, and silicides.

J. W. RICHARDS.

The Electric Furnace in Industrial Chemistry. By C. B. JACOBS. *Elec. World*, March 8, 1902. Paper read before *Am. Inst. Elec. Eng.*, February 28, 1902.—The direct-heating arc furnace and the incandescent furnace are the types most used. The true type of electric furnace is purely thermal in its effects, and has no concern with electrolytic action. In furnaces constructed with linings of pure carbon blocks, reinforced by some very poor conductor of heat, such as magnesia or chalk blocks, it is possible to obtain a temperature close to 4000° C., where the purest carbon begins to vaporize. It is comparatively easy to operate commercially at temperatures of 2500° to 3000° ; the temperature attained depends on the specific heat and weight of the material treated in a given time. The writer then describes the manufacture and properties of silicon carbide, or carborundum, calcium carbide and its actual and possible derivatives, acetylene, anthracene, etc. The Ampère Electrochemical Company discovered the silicides of the alkaline-earth metals, in July, 1899. They have the formulas $CaSi_2$, $BaSi_2$ and $SrSi_2$, and are formed in the electric furnace at a high temperature when the carbonates, oxides, sulphates or phosphates of the metals concerned are mixed with silica in the proportions to form the silicide, with sufficient carbon for reduction; or by mixing alkaline-earth silicate containing base and silicon in the proper proportion with enough

Digitized by Google

carbon to combine with the oxygen. These compounds are white or bluish white and metallic, crystalline, oxidize slowly to oxides, and decompose water yielding hydrogen. Calcium silicide gives, with dilute hydrochloric acid, calcium chloride and Si_2H_2—which may be called silico-acetylene. This is a yellow, crystalline solid, which when heated in a closed tube yields hydrogen and amorphous silicon. Barium silicide is recommended as a cheap and convenient source of hydrogen in commercial quantities, it being brought into contact with cold water in an ordinary acetylene generator. It can likewise be used as a reducing agent, as for indigo, and can be used in perfectly neutral solutions. These alkaline-earth silicides, if melted with iron containing sulphur and phosphorus, form sulphides or phosphides of the alkaline metal, while the silicon unites with the iron. On oxidizing the bath, the former are oxidized to sulphates and phosphates, and pass into the slag. It is said that the last traces of these elements have been thus removed from iron. The writer further speaks of the production of graphite from amorphous carbon, of artificial corundum, phosphorus, and carbon bisulphide. An experiment has shown that when hydrogen gas is passed over kaolin in the electric furnace, silicon hydride and a lower silicate are formed. By continuing the reduction, pure alumina can be obtained, and metallic aluminum has even been produced thus by direct reduction. Messrs. Bradley and Lovejoy have carried the problem of the fixation of atmospheric nitrogen out of the realm of experiment, and have demonstrated the possibility of commercially producing nitric acid and nitrates by the use of a very high tension electric arc.

J. W. RICHARDS.

ORGANIC CHEMISTRY.

The Polybasic Acids of Mesitylene. By MARY BIDWELL BREED. *Bryn Mawr College Monographs*, Vol. I, No. 1, pp. 1–31.—*Diacetyl mesitylene*, prepared from mesitylene, acetyl chloride and aluminum chloride, in direct sunlight, gives no oxime, hydrazone or acid sulphite addition product. Contrary to the statement of Klages (*Ber. d. chem. Ges.*, 32, 1549), it does not give mesitylene when heated with syrupy phosphoric acid. *Dichloracetyl mesitylene*, $(ClCH_2CO)_2C_6H(CH_3)_3$, was prepared in a similar manner, 45 grams of mesitylene yielding 105 grams of the crude diketone, together with traces of chloracetophenone. It melts at 133°–133.5°, is not changed when heated for three hours at 160°–180°, 1000 parts boiling alcohol dissolve 98 parts, 1000 parts alcohol at 21° dissolve 5.5 parts, 1000 parts ether dissolve 26 parts. From the latter solvent, it crystallizes in transparent crystals, 2–3 mm. in diameter. It is insoluble in water, nearly insoluble in ligroin, easily soluble in benzene, acetone and other organic solvents, in cold concentrated sulphuric or nitric acids,

Digitized by Google

being reprecipitated from the latter solutions by diluting. It possesses weak acid properties, dissolving in potassium hydroxide solution with a deep red color, and does not precipitate upon dilution. It gives no color reaction with ferric chloride. *Mesitylene diglyoxylic acid*, $(HOOC.CO)_2C_6H(CH_3)_3$, was obtained when diacetyl or dichloracetyl mesitylene was oxidized with alkaline potassium permanganate. It crystallizes from water in white silky needles, containing two molecules of water of crystallization which is lost at 40°–58°. The dried acid begins to decompose at 150°. It is insoluble in carbon bisulphide and in ligroin, more or less readily soluble in the other ordinary solvents. It gives no color reaction with benzene and concentrated sulphuric acid (unlike phenylglyoxylic acid), no acid sulphite addition product, and its ester does not form a hydrazone. It is a very strong acid, its *acid potassium salt* crystallizing unchanged from dilute sulphuric acid. This acid potassium salt forms thick white prisms which dissolve in dilute sodium carbonate solution with liberation of carbon dioxide, and reprecipitates when the solution is acidified. It dissolves slowly in hot water. The neutral salts are much more soluble than the acid salts. The *neutral barium salt*, however, may be crystallized from hot concentrated solutions. The *dimethyl ester* forms colorless octahedra, when crystallized from ether or methyl alcohol, melts at 103.5°–104.5°, and is readily saponified to the acid. The *diethyl ester* is an oil. The electrical conductivity of the mesitylene mono- and diglyoxylic acids and of their sodium salts was determined and the results tabulated. The monoglyoxylic acid gives a constant $K = 5.27$, while that of phenylglyoxylic acid is $K = 6.11$. The diglyoxylic acid resembles oxalic in its behavior, the values for K decreasing with increasing dilution, from $K = 6.23$ at $v = 16$ to $K = 3.50$ at $v = 256$. *Mesitylene dicarbonic acid*, $(HOOC)_2C_6H(CH_3)_3$, is formed when the diglyoxylic acid is oxidized by an acid potassium permanganate solution, the maximum yield being 70 per cent. of the theoretical. When pure, the acid melts, with decomposition, at 283°. It is easily soluble in hot water and in the ordinary organic solvents. It obeys Meyer's "Ester Law," only 2.3 per cent. of the theoretical amount of ester being obtained by the action of alcohol and hydrochloric acid gas upon it. Its electrical conductivity and dissociation constant were determined, giving a value for $K = 0.0977(?)$, while that for the monocarbonic acid is $K = 0.0375$, and for prehnitylic acid $K = 0.00349$. Mesitylene dicarbonic acid may also be prepared by oxidizing diacyl mesitylenes first with alkaline and then with acid potassium permanganate solution, without separating the intermediate diglyoxylic acid. Concentrated nitric acid dissolves diacetyl mesitylene easily, forming compounds containing nitrogen, but the dicarbonic acid cannot be satisfactorily obtained in this way. Dichloracetyl mesitylene is oxidized by nitric acid

Digitized by Google

with great ease, with production of at least three acids, *chlormesitylene dicarbonic*, mesitylene dicarbonic acid, and an *acid* melting at about 248°. The first of these crystallizes from water in transparent colorless needles, melting at 259°–265°, and containing no water of crystallization. The conductivity of several di-ortho substituted oxy acids of benzene, as measured by Ostwald, was found to be much greater than that of their isomers which are not di ortho substituted. Ostwald explains this as due to the accumulation of negative groups in the ortho position, but the author contends that it is due entirely to the di-ortho relation, irrespective of whether the adjacent groups are negative or positive, and cites several cases in support of this view.

M. T. BOGERT.

On the Action of Phenylhydrazine on Acylthiocarbamic and Acylimidothiocarbonic Esters: Pyrro-α,β'-Diazole Derivatives. BY HENRY L. WHEELER AND ALLING P. BEARDSLEY. *Am. Chem. J.*, 27, 257–270.—Phenylhydrazine reacts with acetoacetic ester and acetylurethane so that the amino group of the hydrazine attacks the acetyl and not the carbethoxy group. The authors find, however, that with urethanes containing sulphur, phenylhydrazine reacts in exactly the opposite manner, hydrogen sulphide or a mercaptan being evolved, and 1,5-dialkyl pyrrodiazoles resulting. 1,3-Diphenyl-5-mercaptotriazole was prepared from benzoyl rhodanide, formylphenylhydrazine and alkali:

$$C_6H_5CONCS + HCONHNHC_6H_5 = C_6H_5{-}C(=N{-}N{-}C_6H_5){-}C(=S){-}SH + H.COOH.$$

The products formed by the action of phenylhydrazine upon the benzoyldithiocarbamates are shown to be identical with those obtained from phenylthiosemicarbazide, benzaldehyde and ferric chloride, and their alkyl derivatives are identical with the compounds formed by treating benzoylimidodithiocarbonic esters with phenylhydrazine, the latter reaction being, therefore, as follows:

$$C_6H_5CON : C(SCH_3)(SCH_3) + C_6H_5NHNH_2 = C_6H_5{-}C(=N{-}N{-}C_6H_5){-}C(=S){-}SCH_3 + CH_3SH + H_2O.$$

The tendency of the groups in these compounds to react with the amino group of the phenylhydrazine is in about the following order: CSAlk>CS>CO>COAlk. When, therefore, an acylimidomonothiocarbonic ester reacts with phenylhydrazine, mercaptan will split out first and then water. In one of the cases investigated by the authors the intermediate product was isolated

Digitized by Google

and identified. The results of the experiments seem to show conclusively that in these 1,4 unsaturated compounds, a 1,2 and not a 1,4 addition or attack occurs. This is probably due to the greater stability of the keto form —CO—NH— as compared with the enol form —C(OH)=N—, and that hydrogen has a greater tendency to attach itself to nitrogen than to oxygen. EXPERIMENTAL PART: Methyl benzoylthiolcarbamate, $C_6H_5CONHCOSCH_3$, and phenylhydrazine. By the action of equal molecules of these substances in alcohol solution, 1,5-*diphenyl*-3-*oxytriazole*, m. p., 290°, was obtained. Benzyl benzoyldithiocarbamate, $C_6H_5CONHCSSCH_2C_6H_5$, and phenylhydrazine, when warmed together without a solvent, yielded 1,5-*diphenyl*-3-*mercaptotriazole*, crystallizing from alcohol in bunches of fine colorless needles, m. p. 187°–187.5°. The same substance was obtained from benzoyldithiocarbamic ethylacetate, $C_6H_5CONHCSSCH_2CO_2C_2H_5$ and phenylhydrazine, and also from phenylthiosemicarbazide, benzaldehyde and ferric chloride. 1,5-Diphenyl-3-chlortriazole, however, when fused with potassium hydrosulphide, was unaltered. The mercaptotriazole is difficultly soluble in cold alcohol, more readily in hot alcohol or in benzene. It is easily soluble in aqueous alkali solutions and is but little attacked by them even when boiling. Its sodium salt is easily soluble in alcohol. It cannot be desulphurized by boiling with freshly precipitated mercuric oxide. From its ammoniacal solution silver nitrate precipitates a bulky white amorphous silver salt, which is not decomposed by boiling. Ethyl benzoyldithiocarbamate and phenylhydrazine react in alcoholic solution with evolution of mercaptan and production of *benzoylphenylthiosemicarbazide*, $C_6H_5CONHCS-NHNHC_6H_5$, which crystallizes from alcohol in colorless six-sided plates or tables, or in slender prisms, m. p. 136°–137°, and is entirely different from the compound assigned a similar structure by Dixon (*J. Chem. Soc.*, **55**, 304 (1889)). Heated above its melting-point, or in presence of a small additional amount of phenylhydrazine, or by dissolving it in alkali and reprecipitating with acid, the compound is changed to 1,5-diphenyl-3-mercaptotriazole. 1,5-*Diphenyltriazole*-3-*monosulphide*, $(C_{14}H_{10}N_3)_2S$, was obtained by heating the mercaptotriazole together with aniline in a sealed tube for twelve hours at 270°–300°, or, with paratoluidine for thirty hours at 180°. It crystallizes from alcohol in bulky pinkish-brown needles, m. p. 198°. 1,5-*Diphenyltriazole*-3-*disulphide* resulted when the mercaptotriazole was dissolved in alcoholic sodium ethylate, and iodine added. It crystallizes from alcohol in small colorless pyramids or sharp-pointed forms, like arrowheads, m. p. 174°. 1,5-*Diphenyl*-3-*benzoylmercaptotriazole*, from the mercaptotriazole, sodium ethylate and benzoyl chloride, in alcoholic solution, crystallizes from alcohol in beautiful colorless needles, m. p. 138.5°. 1,5-*Diphenyl*-3-*methylmercaptotriazole*, from the mercaptotriazole, sodium ethylate and methyl

Digitized by Google

iodide, or from benzoylimidodithiomethylcarbonate and phenylhydrazine, crystallizes from alcohol in colorless tables or six-sided plates, m. p. 102°–103°. Fused with potassium hydroxide, it reverts to the mercaptotriazole again. 1,5-*Diphenyl-3-ethylmercaptotriazole* crystallizes from alcohol in long slender colorless prisms, m. p. 97°. 1,5-*Diphenyl-3-ethylacetatemercaptotriazole* was obtained from the mercaptotriazole prepared from phenylthiosemicarbazide, and also from that prepared from benzyl benzoyldithiocarbonate and phenylhydrazine. It forms beautiful colorless prisms, m. p. 67°. 1,5-*Diphenyl-3-benzylmercaptotriazole* was prepared from benzoylimidodithiobenzylcarbonic ester and phenylhydrazine, from the mercaptotriazole with alkali and benzyl chloride, and by the action of phenylhydrazine upon di(benzoylimidodithiobenzyl) ethylene ester. It crystallizes from alcohol in beautiful flattened colorless prisms, clustered in balls, m. p. 100°–100.5°. *Di(benzoylimidodithiobenzyl)ethylene ester*, $(CH_2S(C_6H_5CH_2S)C : NCOC_6H_5)_2$, from benzoyldithiobenzyl carbamate, sodium ethylate and ethylene bromide, crystallizes from alcohol in fine radiating needles of faint greenish cast, m. p. 93.5°–94°. *Ethylacetate derivative of acetyldithiocarbamic acid*, $CH_3CONHCS\text{-}SCH_2CO_2C_2H_5$, was prepared by warming thiocyanethyl acetate with thiacetic acid. It crystallizes from a mixture of benzene and petroleum ether in yellow needles or slender prisms, m. p. 82°. By the action of phenylhydrazine, it can be converted into 1-*phenyl-5-methyl-3-mercaptotriazole*, which crystallizes from alcohol in colorless difficultly soluble prisms, m. p. 163°–164°. 1-*Paratolyl-5-phenyl-3-mercaptotriazole*, from *n*-propyl benzoyldithiocarbamate and *p*-tolylhydrazine. Colorless needles or prisms, from alcohol, m. p. 170°–171°. *Benzoylimidomonothioethylcarbonate*, $C_6H_5CON : C(OC_2H_5)(SC_2H_5)$, and phenylhydrazine. When these substances react in benzene solution, in molecular proportion, there is obtained *benzoylpseudoethylphenylsemicarbazide*, $C_6H_5CONHC(OC_2H_5) : NNHC_6H_5$, which crystallizes from alcohol in radiating groups of fine needles, m. p. 136°. Water is evolved at the melting-point, causing effervescence. The presence of a slight excess of phenylhydrazine likewise causes this substance to lose water, the product in both cases being 1,5-*diphenyl-3-ethoxytriazole*, m. p. 90°. This latter was also obtained when calculated quantities of the above carbonate and phenylhydrazine were mixed and heated together dry at 140°. 1,3-*Diphenyl-5-mercaptotriazole* forms pure white hairy needles, which sinter and then melt at 248°–249°. The main product of the reaction, however, is a compound which the authors believe to be α'-benzoylimido β'-phenylthiobiazoline,

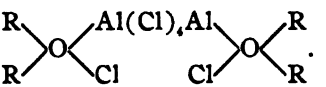
$$\begin{array}{l} C_6H_5\text{—}N\text{———}N \\ \qquad\quad | \qquad\ \| \\ C_6H_5CON : C\text{—}S\text{—}CH \end{array} .$$

Digitized by Google

αα-Carbethoxyphenylsemicarbazide, $C_2H_5OCO(C_6H_5)NNHCONH_2$ from phenylsemicarbazide and chlorcarbonic ester, crystallizes from a mixture of alcohol and benzene in fine needles or prisms, melting at 171.5° with decomposition. It is difficultly soluble in benzene, quite soluble in alcohol, and may be crystallized from water. By the action of sodium hydroxide, sodium ethylate and acetyl chloride, phenylurazole (m. p. 263°) is produced.

M. T. BOGERT.

The Structure of the Substances Obtained by the Addition of Organic Oxygen Compounds and Aluminium Halides. BY ELMER P. KOHLER. *Am. Chem. J.*, 27, 241–257.—All the addition products of organic oxygen compounds and aluminium chloride that have been analyzed hitherto, with the exception of the doubtful compounds with phenols, contain one molecule of an organic compound, which has at least one doubly linked oxygen atom, in combination with one molecule of aluminium chloride, and all the structural formulas which have been proposed are based upon the assumption that this doubly linked oxygen atom is in some way connected with the existence of these substances. The author has already shown (*Am. Chem. J.*, 24, 385) that these addition products have double the molecular weight usually assigned them, and the results of the experiments recorded in the present paper indicate that the presence of a doubly linked oxygen atom is not necessary for the production of such compounds. As those substances which contain two atoms of oxygen in the molecule can combine with twice as much aluminium bromide as those containing but one atom of oxygen, the combination probably takes place through quadrivalent oxygen, as exemplified in such a formula as this:



It seems likely that many of the addition-products described in this paper combine with aromatic hydrocarbons also, and with anthraquinone such a combination was isolated. This suggests, as a possible explanation of the Friedel-Crafts reaction, that the aluminium halide combines with both the acid chloride and the hydrocarbon to a complex molecule which subsequently rearranges. The author concludes that the addition-products of organic oxygen compounds with acids (= oxonium compounds) and those with salts like the aluminium halides have similar structures. EXPERIMENTAL PART: *I. Compounds with Ethers. Phenyl ether and aluminium bromide*, $Al_2Br_6.2(C_6H_5)_2O$.—Large lemon-yellow plates, readily soluble in benzene and carbon bisulphide, insoluble in ligroin. It begins to decompose below 50° when heated alone, and is partially dissociated in boiling carbon bisulphide. *Phenyl ether and aluminium chloride.*—Pale yellow

Digitized by Google

plates, very readily soluble in benzene and carbon bisulphide. *Anisol and aluminium bromide*, $Al_2Br_6.2(C_6H_5OCH_3)$.—Compact pale-yellow prisms, very readily soluble in carbon bisulphide, benzene or anisol. *Anisol and aluminium chloride* combine in the same proportion. *Methylenephenylene ether and aluminium bromide*, $Al_2Br_6.2C_{13}H_{10}O$.—Fine yellow needles, very soluble in carbon bisulphide or benzene, almost insoluble in petroleum ether. At 90°–100° it loses approximately two molecules of hydrobromic acid, leaving a resinous residue. *II. Compounds with ketones. Acetophenone and aluminium bromide*, $Al_2Br_6.2C_6H_5COCH_3$.—Small colorless plates, from a mixture of benzene and petroleum ether, very slightly soluble in carbon bisulphide, more readily in benzene. *Acetylmesitylene and aluminium bromide* combine in similar proportion, forming large pale yellow plates, very slightly soluble in carbon bisulphide or benzene. *Diacetylmesitylene and aluminium bromide*, $Al_2Br_6.C_6H(CH_3)_3(COCH_3)_2$.—Fine reddish yellow powder, the color being due probably to some impurity. It is insoluble in carbon bisulphide, slightly soluble in boiling benzene. No compound of the formula $Al_2Br_6.2C_6H(CH_3)_3(COCH_3)_3$ could be obtained. *Chloracetylmesitylene and aluminium bromide*, $Al_2Br_6.2C_6H_2(CH_3)_3COCH_2Cl$.—The same compound was obtained whether the bromide or the ketone was in excess, and whether the solvent was carbon bisulphide, benzene or nitrobenzene. *Dichloracetylmesitylene and aluminium bromide*, $Al_2Br_6.C_6H(CH_3)_3(COCH_2Cl)_2$.—Small pale yellow plates, sparingly soluble in carbon bisulphide or benzene at the boiling-point. *Dibenzalacetone and aluminium bromide*, $Al_2Br_6.2(C_6H_5CH{:}CH)_2CO$, crystallizes from benzene in large blood-red prisms, slightly soluble in carbon bisulphide and dissolving slowly in boiling benzene. In the latter the substance is probably almost completely dissociated, as its solution is then nearly colorless, the color returning as the temperature falls. *Anthraquinone and aluminium bromide*, $Al_2Br_6.C_{14}H_{10}O_2$.—Fine brick-red crystalline powder, insoluble in carbon bisulphide. It combines with two molecules of benzene, to form a compound, $Al_2Br_6.C_{14}H_{10}O_2.2C_6H_6$, crystallizing in blood-red needles, very unstable, and which readily gives up its benzene again. *Xanthone and aluminium bromide*, $Al_2Br_6.2C_{13}H_8O_2$.—Long yellow needles, readily soluble in carbon bisulphide or benzene. *Acetylacetone and aluminium bromide.*—In a freezing-mixture, fine colorless needles may be obtained of the simple addition product, $Al_2Br_6.2C_5H_8O_2$. This is exceedingly unstable and at higher temperatures readily melts and gives off hydrobromic acid with production of $Al_2Br_4.2C_5H_6O_2$. This then combines with two more molecules of acetylacetone to form a substance which likewise loses hydrobromic acid when heated, further addition of acetylacetone to this latter compound and loss of hydrobromic acid then yielding pure aluminium acetylacetone. *Benzoylacetone* behaves in a similar manner, and this is the best

Digitized by Google

way to prepare the aluminium derivatives of these diketones. *III. Compounds with acid chlorides. Chloracetylchloride and aluminium bromide*, $Al_2Br_6.2CH_2Cl.COCl$, crystallizes from carbon bisulphide in pale yellow plates, and is particularly sensitive to moisture.—*Terephthalyl chloride and aluminium bromide*, Al_2Br_6-$C_6H_4(COCl)_2$.—Fine pale yellow powder, insoluble in carbon bisulphide. It dissolves in a strong solution of terephthalyl chloride in carbon bisulphide and can be crystallized out unchanged. *Terephthalyl chloride and aluminium chloride* combine in the same proportion, forming large transparent plates.

M. T. BOGERT.

BIOLOGICAL CHEMISTRY.

Infectious Diseases. BY ALFRED SPRINGER. *Pop. Sci. Monthly*, 61, 72–76.—Being a review of the causes of the general infectious diseases from a chemical and bacteriological standpoint.

F. P. UNDERHILL.

The Physiological Effects of Electrically Charged Molecules. BY JACQUES LOEB. *Pop. Sci. Monthly*, 61, 76–81.—A résumé of the investigations carried out along this line by the author.

F. P. UNDERHILL.

Ichthylepidin in the Scales of American Fishes. BY ERIK H. GREEN AND R. W. TOWER. *Ztschr. physiol. Chem.*, 35, 196–201.—The method used in this research for the separation and identification of ichthylepidin was that of G. Th. Mörner (*Ztschr. physiol. Chem.*, 24, 125). In the scales of most American teleosts ichthylepidin is present in considerable quantity, but in the scales of the elasmobranchs and those of the *Mola mola* none could be found. In the ganoid scales of the "Gar Pike," Mörner found no ichthylepidin, but in this investigation it could be identified in the ganoid scales of the sturgeon. The scales of the "sunfish" (*Mola mola*) appear to have the same general composition as those of the elasmobranchs. The composition of the scales of the "sunfish" is therefore very different from that of the other highly developed teleosts. F. P. UNDERHILL.

On the Presence of Cleavage Products of the Proteids in Degenerated Liver. BY ALONZO ENGLEBERT TAYLOR. *Ztschr. physiol. Chem.*, 34, 580–585.—This investigation was the chemical study of the liver of a patient who had died from acute yellow atrophy of the liver. Uric acid, leucin, and aspartic acid were present, the last two in considerable quantities. No glutamic acid, hexone bases or purin bodies could be identified.

F. P. UNDERHILL.

Embryo-Chemical Investigations. BY P. A. LEVENE. *Ztschr. physiol. Chem.*, 35, 80–84.—Chemical study of eggs, containing embryos from twenty-four hours' to seven days' old, showed

Digitized by Google

that such eggs contain monoamino acids. It is probable that the investigated preparation consisted of an equi-molecular mixture of amino-butyric acid and amino-valerianic acid.

F. P. UNDERHILL.

Adrenalin: The Active Principle of the Suprarenal Glands and Its Mode of Preparation. BY JOKICHI TAKAMINE. *Am. J. Pharm.*, 73, 523–531; also *Proceed. Physiol. Soc.*, London, 1901. xxix–xxx. *Abst. J. Chem. Soc.*, 81–82, 217.—Adrenalin, $C_{10}H_{15}NO_3$, the active principle of the suprarenal glands is isolated, according to the condition of the solutions from which it is crystallized, in the form of prisms, slender needles, rhombic plates, boat or leaf-shaped, or nodular crystals. An aqueous solution of adrenalin has an alkaline reaction and rapidly absorbs moisture from the air, the solution becoming pink, then red, and finally brown in color. Ferric chloride colors the solution emerald-green, while iodine imparts a vivid pink. On fusion with potassium hydroxide, two crystalline substances were obtained, probably protocatechuic acid and catechol. Adrenalin is the strongest haemostatic agent known and an intravenous injection produces an enormous rise of blood pressure.

F. P. UNDERHILL.

On Adrenalin Glycosuria and Allied Forms of Glycosuria due to the Action of Reducing Substances and other Poisons on the Cells of the Pancreas. BY C. A. HERTER. *N. Y. Med. News*, 80, 865–872.—Adrenalin chloride when introduced into the peritoneal cavity of the dog is usually followed by the appearance of considerable quantities of sugar in the urine. By way of the mouth adrenalin has no effect when given in ordinary doses. Subcutaneous injections of adrenalin chloride yield only slight degrees of glycosuria. Given intravenously adrenalin causes glycosuria, but other conditions being similar, a given dose of adrenalin gives rise to a greater excretion of sugar when administered by the peritoneal cavity than when given intravenously. The glycosuria after moderate doses of adrenalin usually lasts less than twenty-four hours. The adrenal acts presumably chiefly upon the pancreas, but also upon the kidneys.

F. P. UNDERHILL.

The Osmotic Properties of Colloidal Solutions, BY BENJAMIN MOORE AND WILLIAM H. PARKER. *Am. J. Physiol.*, 7, 261–294.—A definite osmotic pressure is exerted by colloids in solution, and it is shown that this pressure is not due to contamination by crystalloids. The direct method is the only one available for determining the osmotic pressure of colloids. The osmotic pressure cannot be used for determining the molecular weight of colloids, since it gives in the case of substances of known molecular weight, such as the soaps, *apparent* molecular weights which are twenty to sixty times too large. The import-

Digitized by Google

ant physical constant so given determines the osmotic properties of the colloidal solution, and the authors have termed it the "solution aggregate." The solution aggregate arises from the physical union or association of a variable number of molecules to form a single osmotic unit. The weight of the solution aggregate varies with the conditions of solution. It is from four to five times as great for serum albumin as for egg albumin. Even dilute solutions of sodium soaps in distilled water form colloidal solutions, at temperatures of from 50° C. to 70° C. Such solutions do not diffuse through parchment paper. The differences in properties of the coagulable proteids may be due to different physical arrangements of chemical molecules to form different aggregates, and the complexity of the proteid molecule may be much more a physical than a chemical phenomenon. Protoplasm may be built up by a continuation of such a process of aggregation. The osmotic pressure of proteids does not, in all probability, take any share in lymph production or absorption. The cells of the membranes in the glomerulus of the kidney probably act as secretory structures. F. P. UNDERHILL.

A Comparative Study of the Viscosity of the Blood. By RUSSELL BURTON-OPITZ. *Am. J. Physiol.*, 7, 243–261.—In this investigation the method used is that given by Hürthle (*Arch. f. d. gesammte Physiol.*, 82, 415–442) for measuring the viscosity of the "living" blood of mammals. The average viscosity coefficient of frog's blood at a normal temperature of 20° C. is 1300; that of the tortoise at 20° C. is 1285. The coefficient of rabbits' blood at a normal temperature of 37° C. is 1350. The viscosity of frog and tortoise blood varies inversely as the temperature. The coefficient changes about 200 for every change of 5° in the temperature. The coefficient of frog's blood at 37° C. is 1700; that of tortoise blood at 37° C. is 1800. The average viscosity of blood serum at 20° C. is 1800. The viscosity coefficients of normal living blood range through a large numerical field, while the variation in the viscosity of serum is small. The changes in viscosity are therefore largely dependent upon the normal solid elements of the blood and only in a less degree upon the constituents of the plasma. The specific gravity of frog's blood is altered by changes in the temperature in which the frog is placed. The specific gravity of frog's blood is increased by potassium oxalate, curare, and deep etherization, and diminished by defibrination. As similar changes are observed in the viscosity, considerable variations in the specific gravity may be taken as an index of variations in the viscosity. F. P. UNDERHILL.

The Combination of Formaldehyde with Witte's Peptone. By TORALD SOLLMANN. *Am. J. Physiol.*, 7, 220–243.—The addition of formaldehyde to a weakly alkaline solution of Witte's peptone causes the formation of a precipitate which develops

Digitized by Google

somewhat slowly. The precipitate is dissolved by boiling with dilute acid or alkali, the solubility diminishing on prolonged contact with the precipitant. The solutions give the general reactions of the original proteose, and may be reprecipitated by reducing the reaction to faint alkalinity. The precipitate contains chemically combined formaldehyde. Only about 40 per cent. of the proteids of Witte's peptone participate in the reaction. The primary albumoses are completely precipitated. The optimum reaction for precipitation is 1.1 cc. *n* alkali per gram of peptone. With an acid reaction no combination occurs, hence, there is no precipitation. The binding of the formaldehyde is associated with a binding of the alkali, the two entering into combination in a constant ratio. Both are liberated in the original quantity, if the compound is decomposed by the action of acid. The combination is favored by greater concentration in alkali, formaldehyde or albumose, and by standing or boiling. The combination is prevented by the presence of neutral salts. One gram of Witte's peptone is capable of combining with 0.0447 gram of formaldehyde and 6.4 cc. N/10 alkali. Acacia does not combine with formaldehyde. F. P. UNDERHILL.

Witte's Peptone: Its Dissociation, and Its Combination with Acid and Alkali. BY TORALD SOLLMANN. *Am. J. Physiol.*, 7, 203–220.—This research gives data concerning the reaction of Witte's peptone towards different indicators, the content of ash, the dissociability of the pure albumose solution, the combination of Witte's peptone with sulphuric acid, and the combination of albumose with sodium hydroxide. Witte's peptone has an average molecular weight of 630, but is dissociable into four molecules by dilution. By heat it splits off an alkaline molecule. Witte's peptone appears to be monovalent towards acids and bases.
F. P. UNDERHILL.

The Effects of Potassium and Calcium Ions on Striated Muscle. BY W. D. ZOETHOUT. *Am. J. Physiol.*, 7, 199–203.—Throughout these experiments the gastrocnemius muscle of the frog was used. Potassium ions produce a prolonged contraction of the muscle. Calcium ions (and to a lesser degree sodium ions) antagonize this action of the potassium ions.
F. P. UNDERHILL.

Body Temperature Variations, with Special Reference to the Influence which the Reversal of the Daily Habits Exercises on Man. BY FRANCIS GANO BENEDICT AND JOHN FERGUSON SCHNELL. *Pflüger's Arch.*, 90, 33–73.—The normal curves of the different individuals of the investigation, showed the usual rhythm of temperature curves. The curve for the temperature of the axillary cavity was for the most part parallel with that of the rectal temperature, nevertheless, there were deviations of the rectal temperature over the axillary temperature of —0.06 to

Digitized by Google

+0.38° C. Muscular activity rapidly increases the body temperature and this increase lasts as long as the work continues. Work of equal intensity causes the same increase of temperature. The cessation of work is accompanied by a significant, long-continued fall of temperature. The temperature during the night following muscular work remained lower than during the nights after a previous rest. The principal effect of fasting consists in the fact that the range of variation of the curve is diminished. Fasting after hard work depresses the variation of temperature, in longer periods of nearly fixed temperature, by about 0.6° C. The average temperature for the fast day after complete rest was not noticeably different from that of the normal day. On fast days after previous hard work the average temperature was lowered by about 1° C. After ten consecutive days in which work was done at night and rest taken during the day, no perceptible tendency to a reversal of the temperature curve could be observed.

F. P. UNDERHILL.

SANITARY CHEMISTRY.

Bacterial Purification of Sewage. BY DR. B. H. BUXTON, Instructor in Bacteriology, Cornell Medical College. *Philadelphia Medical Journal*, **9**, 621 (1902).—This paper, of which a very good abstract appears in the *Engineering Record*, **45**, 387–388 (1902), deals principally with the changes that the animal and vegetable substances in sewage undergo by the action of bacteria. The author divides the solid organic matter into carbohydrates and the proteids. The carbohydrates are comparatively easily broken down and liquefied (hydrolyzed) by the anaerobic bacteria, and the soluble substances so obtained are further broken up into water and gaseous products by both anaërobic and aërobic bacteria. The decomposition of the proteids is more complex. The obligate anaërobics secrete soluble ferments or enzymes which change the insoluble proteids into soluble peptones. The peptones are then acted upon by the facultative bacteria which break them down into gases and various soluble amido products, nitrogen compounds of simpler molecular structure than the peptones but more complex than inorganic ammonium salts. This is done either by oxidation or deoxidation. These amido compounds, according to the author, are then changed into carbon dioxide and ammonia, which, uniting, form ammonium carbonate, other gases being also evolved. The ammonium carbonate, which remains in solution, is acted upon by a highly specialized strictly anaërobic group of organisms, the nitrosifiers, and is oxidized to nitrous acid, and the nitrous acid formed oxidized to nitric acid by another group of organisms, the nitrifiers. The process is tabulated by the author as follows:

Digitized by Google

Substances.	Change to	By
Proteids	Soluble peptones	Enzymes
Soluble peptones	Amido compounds	Anaërobics or Facultatives
Amido compounds	Ammonium salts	Facultatives
Ammonium salts	Nitrites	Nitrosifiers
Nitrites	Nitrates	Nitrifiers.

Besides the above-mentioned products there is a small amount of an irreducible insoluble substance formed, called humus, but not enough to clog the filters.

Animal substances can be liquefied, though slowly, by bacteria acting aërobically; the vegetable substances must first be acted upon by anaërobic organisms, and it is on this account that the Waring aërating filter or Dibden single contact bed methods are not successful with crude sewage. The septic tank, or the Scott-Moncrieff filter, being methods for bringing about the action of the anaërobics, or the liquefiers of vegetable compounds, prepare the sewage for the aërobic bacteria, and when used in connection with contact beds, prevent the clogging of these beds by insoluble vegetable compounds. LEONARD P. KINNICUTT.

The Septic Treatment of Sewage. By BENJ. H. FLYNN, C.E., Engineer Ohio State Board of Health. *Ohio Sanitary Bulletin*, **6**, 72–78 (Feb., 1902).—This paper gives an outline of the development of septic tanks, describes their construction, the method of treatment of sewage in closed and open tanks, and the value of such treatment. The author states that it must be borne in mind that the septic tank is a preparatory step in the work of final purification, and that its importance as a preliminary operation is due to the great reduction which it brings about in the suspended matter without the production of the large amount of sludge so burdensome in chemical precipitation processes. The amount of organic matter removed varies from 40 to 60 per cent.

The effluent from a septic tank is sewage prepared for its final purification which may take the form of dilution, intermittent filtration, contact bed treatment, or irrigation. Dilution is, however, only allowable where there is available a stream of such a size that it is nearly able to care for untreated sewage, and which does not for a number of miles below the admission of the effluent from the septic tank, supply water for domestic use.

LEONARD P. KINNICUTT.

The Character and Value of Aseptic Flooring Material. By KARL LANGENBECK, Supt. Mosaic Tile Co. *Ohio Sanitary Bulletin*, **6**, 54–63 (Feb., 1902).—The paper takes up the dangers that reside in floors made of any vegetable material, it being an excellent environment for all kinds of organisms and ascribes what is known as the "institute smell," of public institutions, as derived chiefly from the floors. It advocates the use of floors made of mineral substances, discusses the advantages

Digitized by Google

and disadvantages of various inorganic substances as flooring materials, and advocates the use of tile floors made of hard baked clay, and for the jointing a cement called Plicaro cement composed of magnesium oxide and magnesium oxychloride.

LEONARD P. KINNICUTT.

The New Sewage Disposal Works at Pittsfield, Mass. BY ARTHUR A. FORBES, Annual Report, Board of Public Works 1901. *Eng. News*, 47, 338–340 (1902); *Eng. Record*, 45, 438–439 (1902).—The plant consists of a receiving reservoir, 1,500,000 gallons' capacity; a 4,800,000-gallon electric sewage pump installation; a force main over two miles long and twenty-five acres of intermittent sand filtration beds. Amount of sewage treated, about 2,000,000 gallons per day.

The most unique feature of the plant is the sewage reservoir divided into three compartments, each 30 x 200 feet. The object of the reservoir is not to serve as a septic tank, but to provide storage so that the total amount of sewage can be pumped in an eight-hour day. LEONARD P. KINNICUTT.

The New Sewage Disposal Works at Gardner, Mass. *Eng. Record*, 45, 338–339 (1901).—Owing to the fact that the intermittent filtration beds built in 1891 were entirely inadequate for the purification of the sewage discharged upon them, a new plant has been constructed at Gardner, Mass.

The novel feature of this plant is the attempt to use coke contact beds in place of a septic tank. The plan, as adopted, contemplated the construction of one and one-half acres of coke contact beds and ten acres of sand filtration beds. As yet only four one-eighth acre contact beds and nine one-fourth acre sand filter beds have been built. The amount of sewage treated is about 225,000 gallons per day.

The coke contact beds are made water-tight by tampered clay. The subdrains are six feet apart laid in hollows and covered to the depth of six inches with coarse broken stone. The filling material is coke breeze, only nine inches in depth.

The sewage is delivered to the coke beds by means of Adams' patent sewage feeds and can be held in the beds any desired length of time by Adams' timed siphons.

The sand filter beds are made beds, three feet six inches deep, the sand being brought from a sand pit in the near neighborhood. They are divided into two groups, and the discharge of the effluent from the coke beds is automatic, first upon one group then upon the other group, and then repeating. By means of hand gates the effluent can also be discharged upon any bed of a group. The works have only been in operation a few months and another year's work will show more clearly what this method of treatment can do. LEONARD P. KINNICUTT.

Digitized by Google

On my last visit to this plant, May 5th, the shallow coke contact beds appeared to be clogged and water-logged.

LEONARD P. KINNICUTT.

Sewage Disposal Plant at Collingwood, N. J. BY G. EVELETH HILL. *Eng. Record*, 45, 415 (1902).—A description of a new plant designed by the City Waste Disposal Company of New York for Collingwood, N. J., a town of about 2000 inhabitants. The plant consists of an annular septic tank; four primary coke contact beds, 3 feet deep, area of each at water line 37 x 37 feet, at bottom 22 x 22 feet; and four "wave filters" 35 x 35 feet. The most interesting feature of the plant is the wave filters. Their construction is as follows: The bottoms are graded with a uniform fall of 1 foot in 10; at the upper end of the beds there is a low brick wall and a brick pavement 3 feet wide. Below the pavement for a distance of 8 feet, the bottoms of the beds are covered with coarse broken stone, rolled until it is sufficiently hard to resist corrosion. The whole area of the beds, save the 3 feet of brick pavement is covered with coke, 10 inches thick at the upper edge and 4 inches thick at the lower edge. On the coke is laid a uniform layer 6 inches thick of coarse broken stone, to prevent washing away of coke and to keep the sewage out of sight.

The sewage, after passing through the septic tank, and the coke contact beds, is discharged by siphons on the wave filters faster than the wave filters can pass the flow, so that the sewage accumulates over the brick pavement behind the filling material and passes through the latter in a wave of considerable height, but not reaching to the surface of the broken stone. As it passes through the bed it drives out ahead of it any gases which have accumulated since the last period of discharge and draws behind it a volume of fresh air to stimulate the action of the aërobic bacteria. No regular analyses have been made, but similar beds at Brooklyn with wave beds 100 feet long gave good results.

LEONARD P. KINNICUTT.

Water Purification Plants in the United States. *Eng. News*, 47, 310–312 (1902).—A table of cities and towns of the United States of 3000 population and upwards, using some one of the methods in vogue for improving the quality of the public water supply. The table gives the population of the city or town, according to the United States census of 1900, the kind of purification employed, and the ownership of the water works. Where several methods of purification are combined at one place, in making the following summary, the leading method in use has been counted. Mechanical filters, 141; slow sand filters, 21; sedimentation basins, 53; filter galleries, 14; filter cribs, 11; softening plants, 2; aërating plants, 5; total, 247, located in 243 cities and towns.

LEONARD P. KINNICUTT.

Digitized by Google

Proposed Light Refuse Crematory for New York City. By Dr. J. M. Woodbury and H. deB. Parsons. *Eng. News*, 47, 314–315 (1902).—Description, with drawings, of a light refuse crematory to be built, in New York City, for the burning of waste paper, excelsior, packing boxes, etc., the primary object being to demonstrate the great saving in final disposal which may be effected by the exclusion from the dumping scows of such bulky material as that named; the secondary to show that such material may be burnt within the city limits without nuisance, or even annoyance to any one. Leonard P. Kinnicutt.

INDUSTRIAL CHEMISTRY.

The Manufacture of Soluble Barium Compounds from Barytes in the Electric Furnace. By Chas. B. Jacobs. *J. Soc. Chem. Ind.*, 21, 391.—As is well known, the barium salts are now obtained by heating barytes with coal or coke in reverberatory furnaces and thus converting the barium sulphate into barium sulphide, which is then decomposed by acids. By the newly patented process of the United Barium Co., of Niagara Falls, barytes is treated in an electric furnace whereby from 97 to 99 per cent. of the available barium sulphate is converted into soluble form. This depends upon the reaction:

$$3BaSO_4 + BaS = 4BaO + SO_2.$$

This reaction takes place beyond the range of temperature available in combustion furnaces and is only possible in the electric furnace. In factory practice, instead of first making barium sulphide in a separate operation and mixing this with the necessary amount of barium sulphate, it has been found more economical to make up the furnace charge of a mixture of ground barytes and coke in the ratio of four molecules of barytes to four atoms of carbon, which on heating reacts to form the mixture of $3BaSO_4 + BaS$ desired for the final reaction. The product as tapped from the furnace is dissolved in hot water and the insoluble impurities filtered off. The hydroxide, $Ba(OH)_2 + 8H_2O$, is crystallized out. The company is offering this in carload lots at a price below that before attainable. Its uses are many but the largest consumption is in the beet-sugar industry as the barium sucrate has many advantages over the calcium sucrate in extracting the sugar from the molasses. S. P. Sadtler.

The Composition of Commercial Cyanide of Potassium. By Russell W. Moore. *J. Soc. Chem. Ind.*, 21, 392.—As cyanide of potassium is imported under lower rates of duty than chemical salts in general, the question was raised whether the presence of considerable amounts of cyanide of sodium in the samples would change its rating. Dr. Moore, as head of the Appraiser's Laboratory in New York, has made a series of analyses of the imported

Digitized by Google

brands of potassium cyanide and finds that the sodium cyanide usually amounts to from 20 to 30 per cent. of the commercial sample and in isolated cases 50 per cent. was found. The Board of General Appraisers has, however, decided that it shall continue to be admitted as cyanide of potassium, its commercial designation. S. P. SADTLER.

By-Product Coke Ovens in Course of Erection by the United Coke and Gas Co. BY DR. F. SCHNIEWIND. *Am. Gas Light J.*, April 28, 1902.—The writer speaks of the relatively rapid adoption of the by-product oven in this country within the last few years and gives the list of ovens erected or in course of erection by the United Coke and Gas Co., as follows:

Company and locality.	Erected in.	No. of ovens.	Use of coke.	Use of gas.
Cambria Steel Co.				
Johnstown, Pa.	1895-98.	160	Blast furnace.	Fuel.
Pittsburg Gas & Coke Co.				
Glassport, Pa.	1896.	120	Blast furnace.	Fuel.
New England G. & C. Co.				
Everett Mass.	1898.	400	Domestic and Locom.	Illum.
Dominion Iron & Steel Co.				
Sydney, C. B.	1900.	400	Blast furnace.	Fuel.
Hamilton Otto Coke Co.				
Hamilton, O.	1900.	50	Foundry and domestic.	Illum.
Lackawanna I. & S. Co.				
Lebanon, Pa.	1901-02.	232	Blast furnace.	Fuel.
Lackawanna I. & S. Co.				
Buffalo, N. Y.	1901-02.	564	Blast furnace.	Fuel.
South Jersey Gas, Elec. & Trac. Co.				
Camden, N. J.	1901-02.	100	Foundry and domestic.	Illum.
Maryland Steel Co.				
Sparrow's Point, Md.	1901-02.	200	Blast furnace.	Illum. and fuel.
Michigan Alkali Co.				
Wyandotte, Mich.	1901-02.	15	Burning lime.	Fuel.
Sharon Coke Co.				
Sharon, Pa.	1901-02.	212	Blast furnace.	Fuel.

The average products of these ovens are 75 per cent. of coke; 5 to 6 per cent. of tar; 1 to 1.25 per cent. of sulphate of ammonia, sold either as sulphate or as concentrated liquor; 4,000 to 5,000 cubic feet of surplus gas of 18 to 20 candle-power, and approximately 700 B. T. U. per cubic foot per net ton.

S. P. SADTLER.

More Light in the Dark Room. BY B. H. WORDSLEY. *Sci. Am. Supp.*, April 19, 1902.—The writer, after portraying the insufficiency and drawbacks of the ruby light, whether from lantern or paper screens, proposes to use glass tanks containing aqueous solutions of eosine and metanil yellow, and to set the tanks in front of the lantern box. He finds that for a very brilliant light, safe ordinarily at two feet from the developing tray, a solution of $^1/_4$ grain eosine, 6 grains metanil yellow and 40 ounces of water will serve and be perfectly safe; for a less brilliant light a solution of $^1/_4$ grain eosine and 3 grains metanil yellow in 24 ounces of

Digitized by Google

water can be used. The glass tank can be constructed of plate glass cemented at the joints with a water-proof cement and the edges covered with melted beeswax. A layer of this latter can be advantageously run in the melted state over the top of the solution to prevent evaporation or change of color of the solution. With these solutions the amount of illumination obtained will be notably greater than with the ruby light. S. P. SADTLER.

The Acker Electrolytic Alkali Process. BY CLINTON P. TOWNSEND. *Elec. World and Eng.*, April 5, 1902 —The Acker process is distinctive in that it electrolyzes fused salt using graphitic carbons as anodes and molten lead as the cathodes and changing the metallic sodium to anhydrous caustic by a jet of steam. The fusion pots or furnaces are of iron cast in two parts only; a body portion for containing the electrolyte, provided with a horizontal partial partition, dividing the vessel into upper and lower chambers which communicate above and with each other and at the other with a well wherein the steam is injected, and a cover for the well, serving the purpose of deflecting the mingled mass of molten lead, caustic soda and hydrogen thrown upward by the steam jet into a chamber where the constituents quickly separate, hydrogen burning freely at the orifice, anhydrous caustic overflowing to the individual collecting vessels and the lead returning by conduits to pass again beneath the anodes in the upper chamber. The steam pipe, a thick walled steel tube, discharges into a casing forming a true injector and constituting a most direct and positive means of circulating the cathode. The anodes, of which four are employed in each furnace, are graphitized carbon blocks made by the Acheson Graphite Co., and carry 2000 amperes each. They are entirely unaffected by the bath, undergoing no corrosion or chemical action and deteriorate from mechanical causes only. The furnaces are lined with magnesite bricks such as are used in basic steel furnaces. The electromotive force between the terminals in the fully heated furnaces is 7 volts and the stated current is 2000 amperes per anode or 8000 for each furnace. This means 75 electrical horse-power for each furnace, and a production for each of 581 pounds of anhydrous caustic per day and an equivalent of chlorine which is carried directly through conduits to the bleach house. The caustic as it leaves the furnace is anhydrous and this irrespective of the amount of steam injected for circulation, as at the temperature employed hydration is impossible. The caustic as it leaves the furnace is probably the strongest that can be made. S. P. SADTLER.

Electrolytic Manufacture of Caustic Soda and Bleaching Powder at Sault Ste. Marie, Ont. BY B. E. F. RHODIN. *J. Soc. Chem. Ind.*, 21, 449.—The process employed here is a mercury cathode process. The electrolytic cell itself is a circular vessel of vitrified earthenware, the bottom surface of which has a

Digitized by Google

number of depending openings and on the top surface also openings corresponding to those on the bottom. Through the openings of the top pass the carbon blocks, from which hang a number of carbon rods which pass down into the openings of the bottom surface of the cell and serve as anode. When the anodes are placed in position, the top surface of the cell is closed and made tight by means of a special cement. The electrolytic cell is then suspended inside of a shallow cast-iron dish five feet in diameter, the bottom of which is covered with a layer of mercury. This seals the interior of the cell from the annular space of the cast iron vessel surrounding the cell itself. While the interior of the cell is filled with brine, the annular space is filled with water. When the current is on, the electrolytic cell itself is being rotated inside the cast iron vessel, the brine is being decomposed, the chlorine is going off at the surface of the brine through the pipe by means of which the cell is suspended and the sodium depositing on the mercury inside each opening of the bottom surface of the cell. The mercury is, however, being rotated strongly by reason of the motion of the cell, so that the portion receiving the sodium and amalgamating with it is being continuously thrown out into the annular space containing water, with which it then forms sodium hydroxide and hydrogen. The mercury freed from the sodium amalgam sinks to the bottom of the annular space and passes back under the cell walls again to receive the sodium deposit. With a view of making the operation continuous there must be a constant supply of brine for decomposition and a continuous drawing off of the sodium hydroxide formed. The composition of an average sample of the bleaching powder produced at the Sault Ste. Marie shows 37 to 38 per cent. of available chlorine, and the average sample of the caustic soda produced shows 74 to 76 per cent. of sodium oxide. The total capacity of the plant, not as yet utilized however, is 9 tons 241 pounds of bleaching powder and 4 tons 565 pounds of caustic soda per working day. S. P. SADTLER.

The Kennicott Water Softener. *Eng. Record*, **45**, 419 (1902)—A description with section and ground plan of an apparatus for softening hard water by use of chemicals. The apparatus appears to be simple and compact. The chemicals generally used are lime and soda, and as there is a device for supplying automatically the relative amounts of chemicals and fresh water required, only a few minutes at intervals of some hours are required for operating the apparatus. LEONARD P. KINNICUTT.

AGRICULTURAL CHEMISTRY.

Buying and Using Commercial Fertilizers. BY L. A. CLINTON. *N. Y. (Cornell) Agr. Expt. Sta. Bull. No.* 201, pp. 179–195.—This subject is discussed in a popular manner and a com-

Digitized by Google

parative test of the availability of phosphoric acid from different sources is reported. Acid phosphate (dissolved phosphate rock), basic slag, floats (finely ground phosphate rock untreated with acid), and boneblack, in quantities furnishing the same amount of total phosphoric acid, were compared on clover, field peas, rape, radishes, oats, barley, and parsnips grown in boxes under similar conditions. Acid phosphate and boneblack gave the best results in every case but one and are recommended as sources of phosphoric acid under usual New York conditions where the effect is desired upon the immediate crop. With rape the best results were obtained with floats. H. W. LAWSON.

Soils and Fertilizers for Greenhouse Crops. BY H. J. PATTERSON AND T. H. WHITE. *Md. Agr. Expt. Sta. Bull. No.* 81, pp. 77–96.—Several soils for greenhouse use were prepared from sandy loam, clay loam, various stable manures, and crimson clover, and compared in experiments with lettuce. Crimson clover was a successful substitute for sod in the preparation of composts. Analyses are given of street sweepings, which material was found very efficient for use in the greenhouse on account of its mechanical effect as well as its manurial value. Experiments with chrysanthemums indicated that phosphoric acid was especially valuable in the production of bloom. Of several fertilizers for lettuce grown in cold frames, nitrate of soda and dried fish combined in the proportion of 1 to 3 and applied at the rate of 1,000 pounds per acre, gave the best results. H. W. LAWSON.

A Plan for Cooperating in the Study of Available Plant Food. BY C. C. MOORE. *U. S. Dept. Agr., Bureau of Chem. Circ. No.* 9, 8 pp.—This gives in detail a plan for the study of methods for determining available plant food in soils which it is desired to carry out in coöperation with the experiment stations. A method for the determination of available P_2O_5 and K_2O proposed by the bureau as a basis for analytical work and which was developed in connection with the researches already published in this Journal (**24**, 79) is given. In this method the soil is digested for five hours in N/200 HCl. A shaking apparatus is used.
H. W. LAWSON.

Provisional Methods for the Analysis of Foods Adopted by the Association of Official Agricultural Chemists, November 14–16, 1901. EDITED BY H. W. WILEY AND W. D. BIGELOW. *U. S. Dept. Agr., Bureau of Chem. Bull. No.* 65, pp. 169.—The bulletin is made up of the reports of the referee and his associates as amended and adopted provisionally by the association. Methods are given for the examination of the following: "Meat and Meat Products," by W. D. Bigelow; "Edible Oils and Fats," by L. M. Tolman; "Dairy Products," by J. A. Le Clerc; "Infant and Invalid Foods," by H. W. Wiley; "Saccharine Products," by A. E. Leach; "Canned Vegetables," by L. S. Munson;

Digitized by Google

"Spices," by A. L. Winton; "Vinegar," by W. Frear; "Flavoring Extracts," by A. S. Mitchell; "Fruits and Fruit Products," by L. S. Munson and L. M. Tolman; "Fermented and Distilled Liquors," by W. D. Bigelow; "Baking Powders and Baking Powder Chemicals," by A. L. Winton; "Food Preservatives," by W. M. Allen; and "Coloring-Matter," by L. M. Tolman. H. W. LAWSON.

Analyses of Corn with Reference to Its Improvement. BY J. T. WILLARD, R. W. CLOTHIER, F. C. WEBER, *et al. Kans. Agr. Expt. Sta. Bull. No.* 107, pp. 57–98.—The work here reported extended over a period of four years. Analyses of one ear each of 33 varieties of corn showed a range in nitrogen content from 1.56 to 2.26 per cent. Analyses of 10 separate ears of each of two varieties showed variations ranging from 1.53 to 2.24 and from 1.35 to 2.22 per cent. in the two cases. The nitrogen content of 17 separate kernels from the same ear ranged from 1.72 to 2.30 per cent. Other analyses of individual kernels of single ears also showed less variation than that exhibited by different ears of the same variety. The germ was found to contain a greater percentage of nitrogen than the remainder of the kernel, hence the selection of seed corn containing large germs is considered the most practical means available for increasing the protein content of corn. The percentage of fat also increases with the size of the germ. Extended determinations showed no definite relationship between the nitrogen content and specific gravity of kernels. A large number of crosses were obtained from 21 varieties of corn used for this purpose in 1898. These have been planted each year since and close fertilized, all crosses, however, containing less than 2 per cent. of nitrogen being discarded. The average nitrogen content of 12 crosses for three years was above 2.40 per cent. Commercial seed corn representing 12 varieties was analyzed at the station and the nitrogen content found to range from 1.39 to 1.81 per cent. H. W. LAWSON.

Experiments in the Culture of the Sugar Beet in Nebraska. BY T. L. LYON AND A. T. WIANCKO. *Nebr. Agr. Expt. Sta. Bull. No.* 73, 27 pp.—Along with the results of variety, fertilizer, and culture tests, and notes on seed production, are given analyses with reference to sugar content and purity of juice of a number of samples of sugar beets. Different varieties grown under similar conditions showed great variations in the yield of sugar. Sugar beets grown on heavy soil had a higher sugar content than beets grown on light soil. The use of commercial fertilizers was not profitable. The presence of weeds very materially lowered the quality of the beets. Wet weather during September increased the size and weight of the beets and lowered the percentage content of sugar. When the fresh growth, however, was unaccompanied by buds, there seemed to be no real loss of sugar. H. W. LAWSON.

Digitized by Google

Sugar Beets in Montana. By F. W. Traphagen. *Mont. Agr. Expt. Sta. Bull. No.* 33, 15 pp.—Analyses are given of a large number of samples of sugar beets grown at the station and in coöperative experiments throughout the state.

H. W. Lawson.

The Chemical Changes in the Ripening of Cheese. By W. F. Sutherst. *Sci. Am. Supplement*, 53, p. 22,007.—The rôle of micro-organisms and enzymes in the ripening of cheese is discussed. Fresh curd was analyzed July 10th and the cheese August 23rd, and October 16th to show the changes in composition during ripening. The total nitrogen on the dates mentioned was, respectively, 4.824, 4.916, and 5.021 per cent. From August 23rd to October 16th, the amount of casein and albumin decreased from 2.203 to 1.850 per cent. and the albumoses and peptones from 1.586 to 1.288 per cent. During the same time the amides increased from 1.120 to 1.848 per cent. and ammonia from 0.007 to 0.025 per cent. H. W. Lawson.

Arid Farming or Dry Farming. By J. A. Widtsoe and L. A. Merrill. *Utah Agr. Expt. Sta. Bull. No.* 75, pp. 67–116.—This bulletin discusses the possibilities and methods of farming without irrigation in arid districts.

H. W. Lawson.

The Utility of Alkaline Phosphatic Manures. By John Hughes. *Sci. Am. Supplement*, 53, pp. 22,034–22,036.—A brief account is given of the history and use of acid phosphate or superphosphate, neutral or undissolved phosphate, and phosphatic, basic, or Thomas slag. In comparing the available plant food in phosphates the author uses a 0.1 per cent. cold solution of citric acid in water. One gram of the material is digested in 1,000 cc. of the solution and the solubility determined at the end of twenty-four hours. In order to obtain a phosphatic manure combining the solubility of acid phosphate and the alkaline nature of basic slag the author mixed ordinary acid phosphate with finely ground or slaked lime, designating the mixture basic superphosphate. In mechanical condition the basic superphosphate is considered superior to acid phosphate or basic slag. The water-soluble portion of basic superphosphate and basic slag was, respectively, 66.80 and 6.60 per cent. containing 22.28 and 4.70 per cent. of soluble lime and no phosphoric acid. In the citric acid solution the solubility of basic superphosphate was 94.20 per cent. the lime amounting to 34.73 and the phosphoric acid to 12.45 per cent. The solubility of a good grade of basic slag was 38.80 per cent., the lime being 22.17 and the phosphoric acid 8.70 per cent. Basic superphosphate is recommended over basic slag and acid phosphate for spring applications to soils containing less than 1 per cent. of lime. Practical tests are noted as showing the value of this fertilizer. H. W. Lawson.

Digitized by Google

Foods and Food Adulterants. Part X, Preserved Meats. By W. D. Bigelow, E. M. Chace, L. S. Munson, L. M. Tolman, *et al. U. S. Dept. Agr., Bureau of Chem. Bull. No.* 13, Part X, pp. 1,375–1,517.—The preparation of canned roast beef or boiled beef is described in detail, the account being based upon personal observations in an inspection of six packing-houses. The canning of other kinds of meat is also described and methods employed in the examination of canned meat are given in full. Analyses of a large number of samples of canned meats are tabulated. Preservatives in quantities not considered excessive in any instance were found in 6.2 per cent. of the 290 samples of American origin and in 40.6 per cent. of the 69 imported samples examined. No canned horse meat was detected. It is believed that this article has never been placed on the market in this country. Data, however, regarding the composition of horse meat are given. The analysis of fats is considered a valuable means of determining the variety of meat, and special studies were made along this line. H. W. Wiley states in an introduction to the bulletin that "It is gratifying to know that, as a result of our investigations, we have found so little to criticise and so much to commend in these necessary products."

H. W. Lawson.

Report of the Chemist. By E. F. Ladd. *N. Dak. Agr. Expt. Sta. Rep.*, 1902, pp. 11–29.—Analyses of materials given in this report include brome grass and timothy cut at different stages of growth, ash of wheat and of brome grass hay, wheat flour, several infant foods, plasmon, boiler scale, and a number of soils and subsoils. Brome grass is shown to have a high value for pasture and hay. Plasmon is considered a valuable food product.

H. W. Lawson.

PATENTS.

JANUARY 7, 1902.

690,409. Edgar S. Downs, New Haven, Conn. Assignor one-half to Clarence S. McLean, Rochester, N. Y. **Carbonometer.** Consists of an ordinary thermometer with its scale and a wet bulb thermometer with two scales, one graduated with the instrument in a well ventilated, occupied, and artificially heated room under changing temperature by noting the registration of the wet bulb thermometer for each point at which the liquid in the dry bulb thermometer registers with a mark on its scale, and the other in the same manner but with the instrument in a badly ventilated, occupied, and artificially heated room, each scale being suitably characterized and numbered.

690,458. Frederick N. Pease and Milton E. McDonnell, Altoona, Pa. **Detergent.** Mixes an acid such as muriatic, oxalic,

Digitized by Google

or sulphuric with a nitrogenous proteid-containing substance such as linseed oil cake, allows the mixture to become viscid and dilutes it with water for use.

690,502. Herbert H. Wing, Buffalo, N. Y. Making **hydrogen sulphide.** Adds a solution containing sulphurous acid to an alkaline earth carbonate to form a sulphite and carbon dioxide; the latter is brought in contact with an alkaline earth sulphide and water, whereby hydrogen sulphide and a metallic carbonate are formed, and collecting the gas.

690,503. Herbert H. Wing, New Brighton, N. Y. Making **magnesium sulphite.** A magnesium compound is treated with sulphur dioxide and water and air, whereby magnesium sulphite and sulphate are produced; the former is separated from the liquor and calcium chloride added to the magnesium sulphate whereby magnesium chloride and calcium sulphate are made, the latter being separated and calcium hydroxide added to the solution of magnesium chloride in solution whereby magnesium hydroxide and calcium chloride are produced.

690,520. Antonin Germot, Asnieres, France. Obtaining **metallic lead** from lead ores. Blows air through a mass of molten galena containing silver or other metals, condensing without contact of external air the fumes of lead sulphide which are separated from the mass and added to a bath of lead or lead sulphide which is then treated with air blown through it.

690,672. Samuel L. Summers, Philadelphia, Pa. **Bismuth oxyiodide methylenedigallate.** Mixes bismuth nitrate, iodine, and potassium iodide with methylene digallic acid, stirring constantly, then repeatedly washing and drying at a temperature not to exceed 60° C.

690,693. Edgar von Boyen, Hamburg, Germany. Making **mineral wax** from bituminous brown coal. Distils the coal with superheated steam in a dry condition, and then distils the product in a vacuum also with superheated steam.

690,804. George Wichmann and Max Gabler, Berlin, Germany. Assignors to Chemische Fabrik auf Actien (vorm. E. Schering), Berlin, Germany. **Salt of hexamethylenetetramin and quinic acid.** Contains 58 per cent. of quinic acid and 42 per cent. of hexamethylenetetramin, a white crystalline body melting at 118° to 125° C., insoluble in ether and chloroform, slowly soluble in alcohol and easily soluble in water.

690,862. Edward P. Lawton, Charleston, S. C. **Copying ink.** An infusion of nut galls, ferrous sulphate, sugar and ammonium chloride. May add carbolic acid.

690,867. William Martin, Chicago, Ill. **Disinfectant.** A mixture of sulphur, 2, and black oxide of manganese, 1 part, heats to 300° F., and the gas liberated is destructive to germs.

Digitized by Google

690,868. James Menzies, London, England. **Waterproofing fabrics.** Boils the fabrics first in a soft soap solution to which sodium silicate and paraffin wax are added, and then treats with acetate of aluminum.

690,888. Erich Springborn, London, England. **Artificial fuel.** Impregnates carbonaceous substance with sugar, then immerses it in a hydrocarbon, adding alkali while immersed, then dries and compresses.

690,889. Harry L. Von Bonhorst, Los Angeles, Cal. Assignor of two-thirds to John Edward Kelly and Nicholas A. Don. same place. **Decorating glass.** Imitates ornamental stones by paint dropped in a semifluid body of slaked lime, which is applied and dried, then washed with water to remove a part of the lime, leaving intermediate spaces which are filled with a coat of ground or basic coloring that is dried and finely coated with sand or similar material.

690,903. Olin J. Campbell and Jacob B. Beam, Bigrun, Pa. Said Beam assignor to said Campbell. Composition for **repairing bicycle tires.** Consists of gum arabic, 1; gray ocher, 8; whiting, 8; rye flour, 4; and lampblack, 2 parts, mixed with water to the consistency of cream.

JANUARY 14, 1902.

690,915. Harriet A. Bentley, Glens Falls, N. Y. **Coating material** for artists' use, the painting surface coated with a mixture of amyl acetate, 50; cedar oil, 1; and pyroxylin, 1, with an outer coating of gelatin.

690,961. Benton K. Jamison, Philadelphia, Pa. Assignor to National Steel Refining Co., Wilmington, Del. Treatment of **armor plates** by slowly heating a mild open-hearth steel containing 0.2 to 0.5 per cent. of carbon and $1^1/_2$ to 5 per cent. nickel to a bright red heat, submerging it the required depth in hardening liquid maintained by cooling at 60° to 70° F., placing a hotter plate at a white heat on the back of the armor plate to anneal the back, removing the plate from the bath and surface tempering the face.

690,962. To same parties as above for **bath for tempering** of sweet spirits of niter, ammonia, zinc sulphate and ground alum, each 3 ounces, ammonium chloride, 6, and glycerol, 8 ounces to a gallon of water. May add an ounce of copper sulphate and sodium nitrate.

690,963. To same parties as above. Method of **mixing the bath.** Adds the alum and zinc salts to the water, allows to rest twelve hours and then adds the other ingredients.

691,058. George F. Jaubert, Paris, France. **Making oxygen.** Uses a pastille of chloride of lime, 200, and an alkaline peroxide as sodium peroxide, 78, dropped in water.

Digitized by Google

691,101. Paul Bergsoe, Copenhagen, Denmark, **Regaining tin.** Subjects tin-bearing material to a stannic salt solution, brings the resulting stannous salt solution between anode and cathode of indifferent material, passes the current whereby tin is deposited on cathode, and the solution made a stannic solution for reuse in the process.

691,132. Hugo Gerresheim, Cologne-Ehrenfeld, Germany. **Reducing nitro compounds.** Treats organic nitro compounds and intermediate products capable of further reduction with iron and alkali.

691,157. George Merling, Frankfort-on-Main, Germany. Assignor to Farbwerke, vorm. Meister Lucius and Bruning, Hochst-on-Main, Germany. **Trimethylhexahydrooxybenzylaniline,** made by treating aminomethylenecycloketones with reducing agents, the same being crystals melting at 68 to 70° C., boiling at 121° C., at 15 mm. pressure, and readily soluble in alcohol, ether and benzene.

691,249. Karl Dieterich, Helfenberg, Germany. **Chemical test paper.** A sheet of paper with separated strips of testing material on it, sensitive to various chemicals and separated by insulating coatings between the strips.

691,257. Max Fremery and Johann Erban Oberbruch, Germany. **Cellulose threads.** These are wound up while fresh and then heated to about 40° C., whereby the threads are held in their natural tension.

691,268. William Jankowsky, St. Louis, Mo. **Enameled metal ware.** Coats the article with a film of an alkaline carbonate, then applies a coating of enamel of an alkaline acid sulphate.

691,324. Alexander S. Ramage, Cleveland, O. **Pigment from ferrous liquors.** Adds soda-ash to a ferrous sulphate or chloride at the same time blowing air through the mass in sufficient water to hydrolyze the basic ferrous sulphate to basic ferric hydroxide, filtering, washing, and drying the same.

691,342. Edwin L. Johnson, Memphis, Tenn. **Extracting cotton-seed oil.** Ten per cent. of cotton-seed bran by weight is mixed with cotton-seed kernels, and the cake while heated is formed and pressed.

JANUARY 21, 1902.

691,383. Henry A. Hughes, Jr., Philadelphia, Pa. Assignor to the Perfection Jar Closure Co., Philadelphia, Pa. **Composition for sealing jars.** Comprises acetic acid, gluten, gelatin, glucose, kaolin, of each about 3 parts, formaldehyde and oil of wintergreen, of each 0.5, water q. s.

691,397. James D. McDonnell, Little River, Fla. **Cement.** Three barrels of crushed calcareous rock, one of calcium sul-

Digitized by Google

phate, one of cement, four ounces each of nitric and nitromuriatic acids, one quart crude carbolic acid and ten gallons of water.

691,421. Cornelius D. Vreeland, Chicago Heights, Ill. **Pigment.** Dries the sludge from aluminum sulphate made from bauxite by the acid process, neutralizes with barium oxide and dries the product.

691,422, and 423, are to same parties for similar processes, including the addition of zinc oxide and oil.

691,470. Harry W. Jordan, Syracuse, N. Y. Assignor to Pittsburg Reduction Co., Pittsburg, Pa. **Aluminum hydroxide,** made by heating CO_2 gas to a temperature above the boiling-point of the aluminic solution to be treated and applying it to said solution.

691,671. Sven A. Sjoo and Reinhold V. Tornell, Stockholm, Sweden. **Cleaning beer vats,** etc. Mixes equal parts of an alkaline hydroxide and a hypochlorite in solution for the purpose.

691,681. Wilhelm Weber, Stollberg II, Germany. **Aseptic preparation from pancreas,** made by first making alkaline a solution containing pancreatin, then adding a salt of an organic acid sparingly soluble in water, then adding enough strong acid to precipitate, and washing the precipitate.

691,711. McKenzie Arnn, Glade Spring, Va. Assignor to M. B. McKinney, same place. **Artificial granite.** Consists of borax, 5; powdered charcoal, 25; plumbago, 10; sodium chloride, 100; sand, 200; rosin, 5; powdered baryta, 100; and slag, 199,155 parts by weight.

JANUARY 28, 1902.

691,749. William S. Corby and Charles I. Corby, Washington, D. C. Making **dough for bread.** Makes a sponge, allows it to rise under the action of the ferment, adds the other ingredients to complete the dough, mixes and aerates, then draws out, sheets and shreds the dough and allows it to rise a second time.

691,822. James Swinburne and Edgar A. Ashcroft, London, England. **Extraction of metals** from sulphide ores. Adds sulphur chloride to a solution of sulphide ores in a fused haloid salt, producing sulphur and a chloride, electrolyzing the latter for chlorine and the metal, and combining the chlorine with some of the sulphur from the sulphide ore for reuse.

691,822. James M. Wright, Bloomington, Ill. Assignor to Horace Blakeley, Indianapolis, Ind., and Jefferson M. Wright, Bloomington, Ind. **Chemical roofing material.** Gum acacia and oxide of zinc, each 1; salsoda, 2; litharge and gypsum, each 25 to 30; slaked lime, 8; coal tar, 600 parts by weight.

691,919. Peter C. Stire, Seymour, Iowa. **Semismokeless powder.** Potassium prussiate, 12; potassium chlorate, 16; corn meal, 2; and wood sawdust, 1.

Digitized by Google

691,934. Clemens Dorr, Germersheim, Germany. Solid materials from tar (**Artificial stone**). Adds 4 to 10 times the bulk of filling material to tar at a temperature of 150° C., heats with stirring to 160° to 190° C., till 7 to 10 per cent. of the tar has been distilled away, and the mixture is dry, and molding the mass.

691,951 and 952. Arthur D. Little, Brookline, Mass. **Waxed paper,** coated with an emulsion of paraffin and viscose. (Cellulose xanthogenate.)

691,966. Thomas B. Osborne, New Haven, Conn., and Robert W. Cornelison, Bloomfield, N. J. Process of **extracting zein.** Treats the raw residue of starch-making with a dilute aqueous alkaline solution, separates said solution from the residue, precipitates the zein and treats the precipitate with a more concentrated alkaline solution.

692,008. Oscar Frohlich, Charlottenburg, Max Huth, Halensee, and Arthur Edelman, Charlottenburg, Germany. Assignors to Siemens and Hälske Aktiengesellschaft, Berlin, Germany. **Separating ores.** Heats the ore to a point intermediate between the decomposing temperature of two metallic sulphates of metals in the ore, passes a dry mixture of heated SO_3 and air over the ore, separates the resultant sulphate by leaching and repeats the above steps.

692,010. Herman Gottschalk, Chicago, Ill. **Kid glove cleaner.** Kneads plastic rubber composition with yeast to make it spongy, boils it in water, rolls it in sheets, vulcanizes it and soaks it in benzene till thoroughly impregnated.

692,018. Rudolph Knietsch, Ludwigshafen, Germany. Assignor to the Badische Anilin und Soda Fabrik, same place. Apparatus for making **sulphuric anhydride.** A holder for the contact material, means whereby a cooling medium is held in close proximity, and means for regulating the cooling capacity of said medium, and suitable instruments to determine temperature and composition of the reacting gases.

692,102. David Bachrach, Baltimore, Md. **Nitrocellulose.** Protects cartridges by graphite and bitumen.

692,139. Paul L. Hulin, Clavaux par Rioperoux, France. Decomposes sodium peroxide with an excess of hydrofluoric acid, then adds aluminum hydroxide forming aluminum fluoride in quantity sufficient to combine with the sodium fluoride and completely precipitate it as **cryolite.**

692,142. Frederick W. Jones, Barwick near Ware, England. **Treating gunpowder.** Mixes granulated gelatinized gunpowder and dry finely divided solid nitrohydrocarbon, agitates whereby the gunpowder grains are coated with the hydrocarbon, then heats the mass above the melting-point of the hydrocarbon, causing the grains thus coated to adhere.

Digitized by Google

692,143. Same as above for the article produced by said process.

692,148. Hugh F. Kirkpatrick-Picard, London, England. **Recovering zinc.** Sulphide ores containing zinc are mixed with a basic material adapted to combine with sulphur and carbonaceous material suitable for coking; this mixture is made into briquettes and distilled so that first they are coked and finally the zinc is volatilized, while the resulting sulphide and non-volatile metals are retained finely divided through the coke.

692,157. Fritz Linde, Dortmund, Germany. **Refining oils.** Adds 10 to 15 per cent rich milk to the oil, heats till a thick coat forms on the top, then removes the scum after boiling, the scum preventing splashing.

692,174. Julius Abel, Mannheim, and Fritz Kalkow, Ludwigshafen. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. **Black sulphur dye.** Heats *o-p*-dinitro-*p*-hydroxydiphenylamine with sulphur, sodium sulphide and copper sulphate, the dye is insoluble in alcohol and dyes cotton direct greenish black to full black that on treatment with hydrogen peroxide becomes dull blue-black.

692,197. Fritz Gehre, Zurich, Switzerland. **Making tiles.** Mixes calcined magnesium carbonate with water and chlorides of magnesium and aluminum, adds limestone spar one part to four of the carbonate and some aluminum phosphate and filling, then molds and bakes the same.

692,198. George W. Geaner, Brooklyn, N. Y. **Alloy,** of iron, 79.89; hydrogen, 11; and copper, 20. May add tin, 2 per cent. Refers to patents 604,580 and 642,320 for the process of exposing extended surfaces of heated iron to hydrogen gas to make an alloy thereof.

W. H. SEAMAN.

Digitized by Google

REVIEW OF AMERICAN CHEMICAL RESEARCH.

VOL. VIII. No. 8.

WILLIAM A. NOYES, Editor.

REVIEWERS:

M. T. Bogert, E. M. Chamot, B. S. Cushman,
Benton Dales, L. M. Dennis, A. H. Gill,
H. M. Goodwin, W. F. Hillebrand, L. P. Kinnicutt,
H. W. Lawson, H. N. McCoy, A. A. Noyes,
J. W. Richards, S. P. Sadtler, J. O. Schlotterbeck,
W. H. Seaman, F. P. Underhill.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

A Report on the Economic Geology of the Silverton Quadrangle, Colorado. BY FREDERICK LESLIE RANSOME. *U. S. Geol. Survey, Bull. No.* 182, 265 pp.—This report covers one of the most interesting and productive mining regions of the United States. The region in question and a wide extent of country beyond is characterized by one of the most extensive complexes of volcanic rocks in the Rocky Mountains, aggregating several thousand feet in thickness of tuffs, agglomerates, and lava flows. With few notable exceptions the mines have been predominantly silver-lead producers, and the region is noted for the numerous new or rare minerals it has produced, chiefly sulpho-salts. The various chemical processes formerly employed for treating the argentiferous ores have given way to mechanical treatment, concentrates being shipped away to distant smelters, where amalgamation on the spot is not resorted to. Recently, cyanide treatment has been introduced for tailings. The ores occur in lodes, stocks, and metasomatic replacements. Typical bodies of the last class are not abundant. The ores are the result of aqueous deposition, primarily by ascending currents. These currents must have differed in their chemical nature in different parts of the quadrangle, judging from the varying character of the deposits. The corrosive solutions found to-day in some mines are, however, descending meteoric waters. The usual impoverishment with depth and change in the character of the ore is noticed here as in so many other mining regions, and the facts all point to a secondary enrichment in the case of the lodes and stocks. The order generally observed from the surface downward was: Argentiferous galena, highly argentiferous stromeyerite, argentiferous bornite, chalcopyrite, pyrite, and finally low-grade auriferous and argentiferous pyrite. A number of analyses accompany the report. Those of mineral species are

Digitized by Google

mostly taken from earlier publications. Among the new ones are the following by chemists of the Geological Survey: Latite and its alteration product from the Polar Star Mine, Engineer Mountain; altered andesitic breccia, White Cloud Mountain; Monzonitic porphyry from the Yankee Girl mine and its altered facies from the National Belle mine. W. F. HILLEBRAND.

Report of the Section of Chemistry and Mineralogy. BY CHRISTIAN HOFFMANN. *Ann. Rep. Geol. Survey of Canada*, 12, 1899, Part R. 64 pp.—The following minerals rare or new to Canada are represented by analyses made by the chemists of the Survey: Lepidolite, schlorlomite, hydronephelite, a mixture of newberyite and struvite, grossularite, and datolite. The following are described in some detail without analyses: Danalite, spodumene, uranophane, cassiterite (variety woodtin) faujasite. The customary numerous analyses of coals and lignites, limestones and dolomites, ores of iron, nickel, cobalt, gold and silver, of well and spring waters, besides miscellaneous notes, make up the balance of the report.

W. F. HILLEBRAND.

Summary Report of the Geological Survey Department [Canada] for the Calendar Year 1901.—The results of operations carried out by the various officers of the Survey are here summarized. Chemical data do not appear, except one analysis of a soil from the Abitibi region, lat. 48°, 38′; long. about 80° 27′.

W. F. HILLEBRAND.

A Geological Study of the Fox Islands, Maine. BY GEORGE OTIS SMITH. *Colby College Bulletin, Vol. I, Supplement.* 53 pp.—First presented as a thesis at Johns Hopkins University (Abstract in this Journal, 19, 71), this study has been rewritten to meet a popular demand, but with many changes. The discussion of the general geology is given in greater detail, the technical descriptions of rock types have been much abbreviated, and analyses omitted. W. F. HILLEBRAND.

A New Government Laboratory and Its Work. BY GEORGE STEIGER AND E. T. ALLEN. *Eng. and Min. J.*, 73, 654–656.—A description, accompanied by photographs, of the chemical laboratories of the U. S. Geological Survey at Washington. A complete list of publications emanating from the chemical division of the survey supplements the descriptive part of the paper.

W. F. HILLEBRAND.

Recent Progress in Petrology. BY F. L. RANSOME. *Science*, 15, 673–674.—This is a brief résumé of three geological papers, one of which has already been noticed in this review (24, 288). Osann's recent paper on the chemical classification of eruptive

Digitized by Google

rocks (*Tschermak's Min. u. pet. Mitth.*, **20**, 399–588) is mildly criticized, and the result is said to be somewhat disappointing.

W. F. HILLEBRAND.

The Mineral Wealth of the Black Hills. By CLEOPHAS C. O'HARRA. *South Dakota School of Mines, Bull. No.* 6. *Dept. of Geology.* 88 pp.—After a brief introduction, historical review, and outline of the general geology of the region, the mineral products named below are taken up in order, by far the most space being devoted to the first-named. Gold, copper, iron, manganese, silver and lead, tin, tungsten, graphite, mica, spodumene, miscellaneous (antimony, bismuth, nickel, uranium). The gold ores and their numerous modes of occurrence in (A) Algonkian, (B) Cambrian, (C) Carboniferous rocks, and (D) Pleistocene deposits, are discussed in detail. The future of the district is promising. New ore bodies are constantly coming to light and the gold output will probably continue to enhance in value annually. It is believed that with economic management some of the tin deposits can yet be made to yield fair profit.

W. F. HILLEBRAND.

On Pyrite and Marcasite. By ALEXIS A. JULIEN. *Science*, **15**, 870–872.—The author cannot regard as proved certain inferences in the paper of Dr. H. N. Stokes bearing the above title (abstract, **24**, 9): (1) "That the hypothesis (of Julien) that most specimens of pyrite and marcasite, even when well crystallized, are mixtures of the two, or paramorphs, is without foundation," and (2) "that the density affords no criterion of the composition." His reasons are given in some detail.

W. F. HILLEBRAND.

On the Occurrence of Uranophane in Georgia. By THOMAS L. WATSON. *Am. J. Sci.*, **13**, 464–466.—This rare hydrated silicate of calcium and uranium is found at Stone Mountain as an incrustation coating the faces of joint planes in granite, and is tipped or coated with clear drop-like forms of hyalite. An analysis of the granite is given and also of the largely contaminated uranophane, from which latter a formula approaching the theoretical is deduced. The deviation is ascribed to the effect of admixed hyalite and granite and to the small amount available for analysis. If the figure given for the $U(UO_4)_2$ weighed (61.28) is not a misprint, the calculated percentage for UO_3 should be 62.44 instead of 60.14 as given by the author, which would materially alter some of the figures in the table of analyses, without, however, invalidating the conclusions. W. F. HILLEBRAND.

Internal Structure of Cliftonite. By JOHN M. DAVISON. *Am. J. Sci.*, **13**, 467–468.—Graphite in isometric crystals occurring in a few meteoric irons is called cliftonite. The author has en-

Digitized by Google

deavored to test by experiments the view held by Fletcher, that these crystals are pseudomorphs after pyrite, and that of Rose and Brezina, that they represent altered diamond. The conclusion arrived at, based on internal structure as revealed by careful grinding, is that cliftonite is not a pseudomorph, but that the second hypothesis is not hereby necessarily confirmed. The question is suggested: May not the graphite have crystallized in a form differing from telluric graphite because of differing conditions? W. F. HILLEBRAND.

ANALYTICAL CHEMISTRY.

Initiative Action of Iodine and of Other Oxidizers in the Hydrolysis of Starch and Dextrins. BY F. E. HALE. *Am. J. Sci.*, 13, 379–399.—An investigation of the causes leading to the production of the red color and of the loss of iodine so frequently observed in iodometric determinations, using starch as an indicator. The conclusions arrived at are:

1. "The loss of iodine and the production of a red color does not take place if an absolutely pure and freshly made starch solution is employed." 2. "Ordinary starch contains, usually, at least two impurities, one coloring red with iodine, the other blue, the latter being readily changed under the influence of oxygen and acid potassium carbonate to the former. These impurities tend likewise to form in pure starch whether solid or in solution." 3. "The impurity coloring blue with iodine is identical with, or analogous to, amidulin, made by saliva digestion of pure starch, and the impurity coloring red with iodine is erythrodextrin, the second product of saliva digestion of pure starch." 4. "The loss of iodine is due to the formation of erythrodextrin from this amidulin-like body, and erythrodextrin does not use up iodine by any transformation to achroodextrins."

In support of the above conclusions the author gives considerable experimental data obtained with potato, arrowroot and rice starches and with pure starch obtained from them. He also shows that "pure starch is not attacked by iodine, hydrogen peroxide or potassium permanganate in the presence of acid potassium carbonate, and that impure starch is attacked."

The starch indicator which seems to have given the best results is prepared as follows: 25 cc. of water and 5 grams pure starch are ground with 2 grams of KI and poured into 75 cc. boiling water and boiled. The mass becomes mucilagenous and after fifteen minutes the volume is increased to 500 cc. Boiling is continued for forty-five minutes. The solution is then filtered, about forty-eight hours being required. There remains on the filter a residue of a jelly-like consistency. The filtrate is employed as the indicator. E. M. CHAMOT.

Digitized by Google

The Quantitative Separation of Hydrochloric and Hydrocyanic Acids. By THEODORE WILLIAM RICHARDS AND SIDNEY KENT SINGER. *Am. Chem. J.*, 27, 205.—The authors base their experiments upon the fact that the "dissociation constant" of a dilute solution of hydrochloric acid is very much greater than that of an equally concentrated solution of hydrocyanic acid, and that the more highly dissociated acid is much more slowly removed by the evaporation of its dilute solution than is an acid that is less dissociated. It was found that when a tenth-normal solution of hydrochloric acid was evaporated, the solution being kept at this dilution by the frequent addition of water, only traces of the acid escaped. Experiments with perfectly pure hydrocyanic acid showed that two hours' boiling sufficed to expel every perceptible trace of that acid, and if the solution of hydrocyanic acid contained only small amounts of hydrochloric acid a complete separation of the two acids was effected by boiling the solution for the same length of time. When, however, large amounts of hydrochloric acid were present, it was found that the chlorine ion tended to form a complex with hydrocyanic acid and it became necessary to boil the solution for a much longer time (eight to ten hours) to effect the complete removal of the hydrocyanic acid. This long boiling did not, however, cause loss of hydrochloric acid.

L. M. DENNIS.

METALLURGICAL CHEMISTRY.

Census Figures for the Metallurgical Industries. *Iron Age*, April 3, 1902.—The Bureau of Manufactures of the 1900 census of the United States gives out the following figures: Establishments in the iron and steel industry, 725, including 57 making tin and terne plates; men employed, 226,161; capital invested, $580,041,710. Establishments smelting and refining other metals, 117: lead, 39; copper, 47; zinc, 31. Capital invested in these 117 works, $139,354,138. Value of manufactured products in 1900: iron and steel, $835,759,034; other metals, $358,786,472. Of the iron and steel products, rolling mills and steel works contributed $596,588,034; blast furnaces, $206,756,557; tin and terne plate, $31,892,011; forges and bloomeries (of which only 7 remain), $522,432. J. W. RICHARDS.

Mineral Production of Colorado. By H. A. LEE. *Eng. Min. J.*, April 19, 1902. (Abstract of Report of Commissioner of Mines.)—This state produced, in 1901, 13,420 short tons of zinc, in ore, of which 30 per cent. was reduced in the state. The large iron plant at Pueblo used or produced: iron ore, 352,000 tons, pig iron, 165,000 tons, spiegeleisen, 9,460 tons, steel rails, 154,500 tons, steel plate, 104 tons, merchant iron, 33,900 tons, castings, 12,450 tons, iron pipe, 6,850 tons, spikes, bolts, etc.,

Digitized by Google

10,700 tons. Lake County produced 68,500 long tons of 29 per cent. manganese ore. 318.6 tons of bismuth was mined in gold and silver ores, for which the price paid was $8 to $15 per unit (each 1 per cent.) of bismuth present. Boulder County produced 65 tons of tungsten ore, averaging 60 per cent. tungstic acid, valued at $135 per ton. Nearly 6,000,000 tons of coal were mined, of which 1 per cent. was anthracite and 10 per cent. lignite; 557,000 tons of coke were made. 17,000,000 gallons of petroleum were produced, and the output is increasing.

J. W. RICHARDS.

The Crow's Nest Pass Coal-Fields. BY W. M. BREWER. *Eng. Min. J.*, April 19, 1902.—A description of the geography, history, geology and working of this field, in the southeast corner of British Columbia. The discovery of the Boundary Creek metal mines in this neighborhood has given importance to these deposits. Three railways enter the district. Most of the mines are operated by electric power. The seams are 6 to 36 feet thick, there being in some places 198 feet thickness of seams in 1847 feet of depth. There are 424 ovens at Fernie engaged in coking coal from this field; they are of the beehive style, producing an average of 2 tons of coke each daily.

J. W. RICHARDS.

The Iron Resources of Texas. BY DR. W. B. PHILLIPS. *Iron Age*, April 17, 1902. (Read before Eng. Soc. of W. Pa.)—In Northeast Texas there are deposits of good limonite of sufficient extent to warrant operations on a large scale. The average cost of making pig iron therefrom, under present conditions, would be nearly $11 per ton. The magnetites of Llano Co., in Central Texas, 100 miles northwest of Austin, show 63 to 66 per cent. of iron with 0.032 to 0.064 of phosphorus. These ores would have to be rigidly inspected if sold as Bessemer ores. They are not being worked. Hematites, high in phosphorus, are found in the same county. These ores have not been sufficiently prospected to prove their extent. The nearest coal is 280 miles away; the nearest working blast-furnaces, 293 miles. To ship these ores, they would have to be hauled 319 miles to Galveston. The distance to St. Louis furnaces is 918 miles, or 40 miles less than from Lake Superior to St. Louis. There is a good market for pig iron in Texas.

J. W. RICHARDS.

A New Canadian Iron and Steel Plant. BY WALDON FAWCETT. *Sci. Am. Suppl.*, April 26, 1902.—The Dominion Iron and Steel Co., with an authorized capital of $15,000,000, has acquired iron ore property on Great Bell Island, in Conception Bay, Newfoundland, and limestone quarries on West Bay of the Bras d'Or lakes, and has erected its manufacturing plant at Syd-

Digitized by Google

ney, Cape Breton, Nova Scotia. Great Bell Island contains the Wabana ore bed, which consists of small regular blocks of red hematite, most of them 4 by 2 by 2 inches, piled regularly and compactly in a bed 8 feet thick, covering 817 acres, estimated to contain 28,000,000 tons of 54 per cent. ore. The daily mining capacity is 600 tons, which is put on the vessels at a cost of 50 cents per ton. The fuel resources are the Sydney coal fields, of 200 square miles area, adjacent to the plant. The field is controlled by a 99-year lease, giving the company 2,500,000,000 tons of fair quality bituminous coal. This coal can be coked. The coking plant consists of 400 Otto-Hoffman by-product ovens, costing $1,250,000, arranged in two rows of four batteries, of 50 ovens each, with a total daily capacity of 1,600 tons. A coal-washing plant, adjacent, has a daily capacity of 2,400 tons. The pyritic mines of Newfoundland furnish material for the sulphuric acid plant, with a capacity of 40 tons of acid daily. In addition to the marble quarry mentioned, the company owns a dolomite quarry on the St. George's River, only 14 miles from Sydney, with a daily capacity of 1,200 tons.

The steel works proper contains four blast-furnaces, each 85 feet high by 20 feet diameter, with Cowper stoves provided with 200-foot chimneys. The engine house contains five blowing engines, and the boilers are of 8,000 H. P. The metal is taken in 25-ton ladle-cars to a motor-driven pig-casting machine, with a daily capacity of 1,600 tons ; or it is transferred direct to the open-hearth furnaces. The ten open-hearth furnaces are of the tilting type, in one row ; metal may be poured in on either side ; cold pig and stock are fed by two charging machines. The 1,400 tons of daily product are tapped into 50-ton ladles and poured into moulds set on cars. There is a 36-inch blooming mill, with pit-furnaces, and the mill has two 20-ton overhead traveling electric cranes. The Canadian government now gives $3 bounty on each ton of pig iron made from native ore, and the same amount on steel, but this will be gradually reduced to 60 cents a ton, in 1907.

A 325-Ton Hot-Metal Mixer. By A. C. Johnston. *Eng. News*, April 3, 1902.—The storage mixer should have the capacity of at least four blast-furnace casts ; or, for 500-ton furnaces, making each 6 casts of 80 tons daily, 320 tons. The first mixer, built at the Edgar Thompson works in 1888, had a capacity of 100 tons. This new design, for 325 tons, has a circular bottom mounted on two sets of rollers, on which the whole weight rests, instead of on trunnions. The sides and bottom are of 1-inch steel plates ; the bottom is stiffened by 12-inch I beams. The pouring spout is balanced by cast-iron counterweights. The fire-brick lining is 18 inches thick on the bottom and sides, and 14 inches on the roof. The roof is arched in two directions, in order to key the bricks in tighter. The heat is kept up by three fuel-oil

Digitized by Google

burners with universal joint connections. The vessel is tipped by two single-acting hydraulic cylinders operating on a common plunger. J. W. RICHARDS.

An Improvement in Crucible Steel Practice. BY G. P. BLAKISTON. *Iron Age*, April 24, 1902.—The crucible, after being taken from the melting hole and teemed, is not allowed to cool, or bathed in clay and water to renew the outside surface, but is put on a "shaker," while still hot, and rocked gently as the charge of scrap and steel is being put in from a chute. By this means the charge settles down, so that more is gotten into the pot; the crucible can be put back at once into the melting hole, and it is claimed that crucibles stand ten heats instead of three or four. J. W. RICHARDS.

Specifications for Rolled Steel. *Eng. News*, April 3, 1902. (Report of Committee to Convention of Railroad Engineers.)—The proposed specifications are simply the points on which there was no serious disagreement in the committee; points on which they disagreed are not given. The most important are, that the steel shall be made by the open-hearth process, that rivet steel must contain not over 0.04 sulphur or phosphorus; other steels, sulphur not over 0.05; phosphorus in basic steel not over 0.04, in acid steel not over 0.08 per cent. Tensile strengths of rivet steel shall be 48,000 to 56,000 pounds minimum yield point, 26,000 pounds minimum elongation 28 per cent.; for framing materials, the ultimate strength of 55,000 to 65,000 pounds is recommended. All fractures must be silky; a dull or crystalline fracture will be considered a failure. J. W. RICHARDS.

The Geology of the Galiuro Mountains, Arizona. BY W. P. BLAKE. *Eng. Min. J.*, April 19, 1902.—The discovery of the "Gold Mountain" ledge has stimulated interest very greatly in these mountains. The range is of ancient rhyolite, cropping out in jagged peaks, modified by a later fragmentary deposit covering the rough ancient croppings and filling ancient valleys. The gold-bearing ledge is novel and unusual in composition and structure. It is a granular quartzite, not vitreous, traversed by thin veinlets of normal quartz mineralized with iron pyrites and gold. This pyrites weathers to hematite. Where Rattlesnake Creek cuts the ledge, the lode is exposed 90 feet vertically, with a thickness of 50 feet. The foot wall side has a distinct columnar structure for 20 feet, which suggests a dyke-like origin of the vein. The whole lode forms a large body of low-grade ore.
J. W. RICHARDS.

Matte Smelting in Celebes. BY S. J. TRUSCOTT. *Eng. Min. J.*, April 12, 1902.—At the Soemalata Mine the ore is crushed and jigged to about sulphur, 30; iron, 50; copper, 1; zinc, 3; lead,

Digitized by Google

2; arsenic and antimony, 4; lime and alumina, 5; silica, 5 per cent., with 1.5 ounces of gold and 4 ounces of silver per ton. This is smelted as follows: 2,600 pounds ore, 800 pounds coral, 200 pounds wood or 70 pounds coke. Warm blast is used and 1 of matte is produced per 4 of ore. It is essentially an iron matte, with 1 or 2 per cent. of copper and 6 ounces of gold per ton; the slag is fluid and clean. Sometimes wood is the only fuel used; it is in small blocks and green. Chinese coolies do the work, with one European overseer, and the cost is only 75 cents to $1 per ton of ore smelted, when running continuously. The matte is shipped to Europe. J. W. RICHARDS.

Improvements in Lake Superior Ore Dressing Practice. *Eng. Min. J.*, April 5, 1902.—Description of the new mill of the Osceola Company, which has cost nearly $500,000, which with its seven stamps will crush 3,500 tons of rock per day. These stamps have a circular mortar with a $^5/_8$-inch screen, and will extract 20 per cent. of the metallic copper directly. Hydraulic separators between the stamps and jigs take out 22 per cent. more. Thus the jigs are relieved of nearly half the copper in the ore. Three samples of tailings from the jigs are taken daily. The average copper left in the tailings has been reduced from 0.187 per cent. in the old mill to 0.065 per cent. in the new one; the extraction in the new mill is over 94 per cent. of the 1.159 per cent. of copper in ore. The cost of dressing was 29.22 cents per ton in the old mill and 22.1 cents in the new one. The 40,000,000-gallon Nordberg pump costs, for pumping, about 2 cents per ton of ore. The total gain by the new mill will be at least 5 cents per ton in cost of dressing, and 16 cents per ton on increased value of copper saved. J. W. RICHARDS.

An Automatic System of Sampling. BY P. JOHNSON. *Eng. Min. J.*, April 12, 1902.—A detailed description of a new design of sampling machinery installed at the British Columbia Copper Co's. works at Greenwood, B. C. Analyses are given of eleven ores each sampled independently twice and the two samples analyzed, with extremely close results, mostly within the errors of analysis. J. W. RICHARDS.

The New Smelter at El Paso, Texas. *Eng. Min. J.*, April 19, 1902.—This plant replaces the one destroyed by fire in 1901, and represents the most advanced type of lead and copper smelter. Crude oil from Beaumont is used in the boiler and roaster departments. There are 7 large lead furnaces, each with a capacity of 200 to 250 tons of charge daily, and 3 copper furnaces with capacity of 250 to 300 tons daily. A new feeding system consists of 6-ton charging cars, electrically driven by a third rail system, which collect their charge, are then elevated 38 feet on 15-ton hydraulic elevators to the tops of the furnaces, and travel over

Digitized by Google

them, dropping their charges directly into the furnaces. Two men thus charge 1000 tons per day. J. W. RICHARDS.

The Disseminated Lead Ores of Southeast Missouri. By F. L. NASON. *Eng. Min. J.*, April 5, 1902.—The ores of this region are surface ores and disseminated ores. The former occur in large, coarsely crystalline masses or clusters of crystals, in seams and channels in surface clays, attached to, but never penetrating, the limestone. The latter occur in fine-grained crystalline masses in layers or beds parallel to the limestones or slates, or penetrating and filling with fine crystalline grains certain strata of limestone associated with the slates. The surface ores rarely reach a depth of 100 feet; the disseminated ores never appear on the surface, are rarely more than 50 feet above the LaMotte sandstones, and often lie in contact with them or penetrate them, at depths of 200 to 400 feet from the surface. These disseminated ores begin to tarnish within a few days after being mined, becoming an iridescent blue deepening to a dark Prussian blue, while the enclosing rock changes through various shades of brown. No surface ores undergo these changes. Disseminated lead has been found under ground which shows no surface ores. The known ore belt is 25 miles long by about 5 miles wide, but how much of this contains paying ore has not been satisfactorily determined. J. W. RICHARDS.

Lead and Zinc Deposits of the Ozark Region. *Eng. Min J.*, April 5, 1902.—Extracts from Report of U. S. Geological Survey on the definition of the region, its ore-bearing formations, theory of its ore deposition, genesis of the ores, classes of mines and depth of ore bodies. The ores have been derived from the enclosing rocks by deposition from dilute solutions. The ore bodies are the net result of a long series of concentrations. There are small quantities of lead and zinc sulphides in the country rock; these have been oxidized to sulphates, transported in dilute solution and precipitated at favorable localities. J. W. RICHARDS.

The Production of Zinc Ore in the United States. By W. R. INGALLS. *Eng. Min. J.*, April 5, 1902.—In 1900 the Joplin District of Missouri and Kansas produced 242,330 tons of ore; New Jersey, 221,053; Colorado, 77,984; Wisconsin, about 15,000; Iowa, 2,000; Tennessee, 3,968; in addition small amounts came from Arkansas, New Mexico, and Virginia. In the Joplin District, a small amount of silicate ore, assaying, when sorted, 40 to 45 per cent. zinc and worth $10 to $15 per ton on the cars, is mined at Granby and Aurora; the rest is all concentrated blende, each ton of which represents probably 20 tons of mineral mined. The concentrate averages 60 per cent. of zinc, and is quite free from iron and lead. With zinc worth 4 cents per pound at Joplin, the concentrate commands about $25 per ton. The galena

Digitized by Google

concentrate amounts to about 10 per cent. of the weight of zinc concentrate, and averages 77 per cent. of lead. Large quantities of ore are mined for 60 cents per ton and milled for 30 cents; the average value of the ore is $1.25 per ton. The zinc ore of Colorado comes from the mixed sulphides of Leadville and Kokomo. The blende in it has accumulated in the tailings heaps, but is now being separated, yielding a ferruginous blende which has found a market in Europe and Kansas. This concentrate has been carried from Leadville to Antwerp, via Galveston, for $9.50 per ton; the miners in Leadville receive $5 to $7 per ton for it. It is hard to work because of the large amount of iron in it, but on that very account it lends itself to magnetic concentration, and the Colorado Zinc Ore Company and the New Jersey Zinc Company are introducing magnetic concentration plants at Denver and Cañon City, using Wetherill machines. The New Jersey mines rank among the great ore deposits of the world; the ore as mined runs about 25 per cent. of zinc, while its iron and manganese content are valuable for the manufacture of spiegeleisen. The ore is dressed by Wetherill magnetic machines, producing a *willemite* product assaying 50 per cent. of zinc, 4 per cent. of manganese and 2.5 per cent. of iron, and a *franklinite* product which is first used for the direct manufacture of zinc white, while the manganiferous residue is smelted to spiegeleisen. The mines of the Bertha Zinc and Mineral Co., near Pulaski, Va., yield calamine ore of great purity, which is concentrated to about 40 per cent. of zinc before smelting. The deposits are extensive and unique, being overlaid by a thick deposit of ferruginous clay, from which iron ore is recoverable by washing. There are some promising deposits in Tennessee, but too remote from the railway to be accessible, while some of them carry barytes, which makes concentration difficult, if not impossile.

J. W. RICHARDS.

The Palmerton Plant of the New Jersey Zinc Company. By G. C. STONE. *Eng. Min. J.*, April 5, 1902.—The plant is in the Lehigh Valley, in Pennsylvania, nine miles east of Mauch Chunk, on a strip of ground 200 to 1,000 feet wide by 1½ miles long. There is a trestle 3,000 feet long and 30 feet high for storing coal, ore, and limestone in bins. A storage yard holds 6,000 tons of ore and a like quantity of coal. The zinc oxide plant has a furnace room 50 feet wide and 1,260 feet long, containing 288 furnaces built back to back in rows of 12, producing zinc oxide by the Wetherill process. The bag rooms have a floor area of nearly two acres, and contain over 27 miles of bags. Storage capacity is provided for 4,500 tons of oxide in barrels. The residue from these furnaces is dropped ten feet into steel cars, and taken to a 60-foot high spiegel furnace. This has a 14-foot bosh, and is equipped with a Brown automatic hoist and

Digitized by Google

charging device. An elaborate system of dust-catchers, in duplicate, to catch the evolved zinc oxide, is provided. The distillation plant consists of two large regenerative gas furnaces, run by 11 Taylor gas producers. The furnace floor is 14 feet above the ground, the regenerators being above ground, beneath this floor. Refuse material can be dropped into hoppers and thence into steel cars below. South of this plant is the "lithophone" department with a present capacity of 5 tons per day. An experimental acid plant to test the Schroeder contact method of making sulphuric acid is being erected, the company having acquired the patents for the process in this country. A sheet-zinc rolling mill is also being erected. The final capacity of the plant will be, yearly, 60,000 tons of zinc oxide, 72,000 long tons of spiegeleisen, and 30,000 tons of metallic zinc.

J. W. RICHARDS.

The Nickel Combination. *Eng. Min. J.*, April 5, 1902.—The International Nickel Company has been organized chiefly by the efforts of Col. R. M. Thompson, with the assistance of Mr. Schwab and Col. De LaMar. The president is Ambrose Monell, formerly metallurgical engineer of the Carnegie Steel Co. The company will own a controlling interest in the Canadian Copper Company, the Oxford Copper Company, the Anglo-American Iron Company, the Vermillion Manufacturing Co., the American Nickel Works of Mr. Wharton in Camden, the Nickel Corporation (Limited) of London, and the Société Miniere Caledonienne in New Caledonia. The Société Le Nickel, with its reduction works in France and extensive properties in New Caledonia, is not included; neither is the Mond Nickel Company, nor the Lake Superior Power Co., which latter has properties in the Sudbury district, and proposes to refine nickel at Sault Ste. Marie. The company will also have a considerable output of copper. It has no official connection with the United States Steel Corporation.

J. W. RICHARDS.

Notes on Platinum and its Associated Metals. BY J. F. KEMP. *Eng. Min. J.*, April 12, 1902. (A more extended treatment will be found in Bulletin 193, U. S. Geol. Survey.)—The richest nugget yet assayed yielded 86.5 per cent. of platinum; the greater part average 70 to 85 per cent., while not a few are lower yet. Of the other metals present, iron is by far the most abundant. A specimen from the Urals showed 19.5 per cent. iron with 68.8 per cent. platinum. As a rule, iridium, rhodium and palladium are always present, but the iridium seldom reaches 5 per cent. until the platinum falls below 60 per cent.; rhodium seldom reaches 4 per cent., and palladium is less than 2. Smaller percentages of osmium, ruthenium, copper, and sometimes gold are often found. In the way of mechanical admixture, chromite is

Digitized by Google

the commonest associated mineral; more rarely, olivine, biotite, and pyroxene. Iridosmine in scales has been found in with platinum sand. Other minerals containing platinum are platin-iridium, palladium, allopalladium, and iridosmine. Sperrylite is $PtAs_2$, and laurite RuS_2, with a little osmium replacing Ru. Platinum, in place, is found in basic, igneous rocks rich in olivine, the peridotites, which frequently contain chromite, and are readily metamorphosed to serpentine. Assays of these rocks have shown platinum, but in very small quantities and irregularly distributed. It has been detected also in pyroxenites, chloritized granite, syenites, and gabbros, hornblendic gneiss and Triassic shale, clay, slate and mica schist, and at Broken Hill, even in kaolin. Platinum has been found in small quantities in gold-bearing veins, but its most important commercial association is with copper ores. It has been found in tetrahedrite, and as sperrylite in the Sudbury nickel copper deposits, and in the covellite of the Rambler Mine, 60 miles south of Laramie, Wyoming (see these Abstracts, April, 1902.) It is therefore important that platinum be looked for more carefully in copper ores, as minute quantities may be profitably saved in the subsequent electrolytic refining. It is likewise important to look for it in association with chromite, its commonest associate, in place. J. W. RICHARDS.

A Borax Mine in Southern Oregon. BY W. B. DENNIS. *Eng. Min. J.*, April 26, 1902.—The deposit is 10,000 acres of marsh land in Harney County. The area is perfectly level and treeless, the ground being covered several inches thick with crude borax, containing sodium carbonate, sulphate, chloride, etc., in varying proportions. This is raked up into heaps, in summer, and in a short time the deposit reappears. The material as gathered contains 5 to 20 per cent. of boric acid; it is put into tanks and boiled with chlorine or sulphuric acid, thus dissolving the bases and liberating the boric acid. The hot solution stands twenty-four hours, after which the clear liquor is run into crystallizing tanks. On cooling, the pearly scales of boric acid are obtained, which are washed with cold water. The annual output is 400 tons, which is hauled 130 miles to Winnemucca, Nev., on the Central Pacific Railroad. J. W. RICHARDS.

Hargreaves-Bird Process for the Electrolytic Production of Soda and Bleach. BY E. WALKER. *Eng. Min. J.*, April 5, 1902.—Two years ago ground was bought to erect a plant at Middlewich; production was commenced in April, 1901, and 56 cells are now at work, while 56 more are being erected. The cells are 5 feet by 10 feet, set on end, and 1 foot thick. The anodes are gas carbon, the cathodes copper-wire cloth. On the inner surface of the cathodes and in contact with them are the ¼ inch thick diaphragms, composed of a hard asbestiform material

Digitized by Google

whose exact composition is kept secret. It allows the soda to pass through to the cathode, but prevents the passage of chlorine or undecomposed salt. The soda comes into contact with steam and carbonic acid, at the cathode, and the solution of carbonate trickles out at the bottom. Each cell takes 2,300 to 2,500 amperes at 3.7 to 3.9 volts, decomposing 237 pounds of salt in twenty-four hours, producing 395 pounds of bleach containing 37 per cent. of chlorine and 578 pounds of sodium carbonate crystals. The life of each cell averages 100 days. The soda solution is concentrated and the crystals separated out in centrifugals. The present output is 70 to 80 tons of soda crystals and 50 to 55 tons of bleach. The soda crystals are over 99 per cent. pure, as against 98 per cent. purity of the Solvay product and 97 per cent. purity of Leblanc soda. The bleaching powder is always over 37 ½ per cent. chlorine, and is often 38 to 39 per cent. Salt is obtained directly on the property, at 180 feet depth; the items of expenditure are thus chiefly coal, limestone and wages.

J. W. RICHARDS.

INDUSTRIAL CHEMISTRY.

Blue-Print and Black-Print Photographic Papers and Their Preparation. BY ALFRED I. COHN. *J. Soc. Chem. Ind.*, May 15, 1902, p. 582.—After referring to the early experiments of Herschel and Pellet on the production of a blue-print paper, the author gives an account of the procedure of Pizzighelli and v. Itterheim which is that at present in use. The mixture they proposed is as follows: (1) Gum acacia, 20 parts; water, 100 parts. (2) Ferric ammonium citrate, 50 parts; water, 100 parts. (3) Solution of ferric chloride, 50 parts; water, 100 parts. Of these solutions, first mix 20 volumes of No. 1 with 8 volumes of No. 2, and then add 5 volumes of No. 3. This order must be strictly followed. The mixture, when made, thickens in a few minutes to the consistency of soft butter. It is set aside over night to "ripen" and used the next day. It is absolutely essential to use a well-sized paper, otherwise a clear print cannot be obtained. The development is effected by applying a 20 per cent. solution of potassium ferrocyanide with a brush passed over the print in parallel strokes. The image starts out in pale blue lines on a greenish blue ground. The print is then immersed in very dilute sulphuric or hydrochloric acid in which the image at once becomes deep blue while the greenish blue ground disappears and gives way to a pure white. The print is then finished by washing thoroughly with clean water to remove the acid which must not be left in the paper.

The production of black lines on a white ground is effected either by the use of ferric chloride with an organic acid like tartaric or oxalic and development with gallic or tannic acid, or by

Digitized by Google

the use of aniline vapor acting upon a paper coated with bichromate of potash and then exposed to the light. The former process is that of Poitevin improved by the author while the latter is the Willis so-called "aniline" process.

Salts of manganese, cerium and cobalt have also been used, and with different developers give very different colors. Lastly should be mentioned the "primulin" or "diazotype" process of Messrs. Green, Cross and Bevan which prints upon paper, cloth and silk.

The author also gives figures, and describes the machinery for coating the paper with the solutions for blue-print and black-print papers. S. P. SADTLER.

Kennicott Water Softener. *Eng. Rec.*, May 3, 1902.—The article describes and illustrates what is probably the first automatic chemical water-softener brought out in the United States. The treatment is continuous in its action in that the chemicals and hard water are brought together as the softened water is drawn from the apparatus, and an interesting device is used to supply automatically the relative amounts of the chemicals and fresh water required.

Lime dissolved in soft water and soda are used as purifiers in addition to filtering partitions, settling tanks and baffle plates. The Kennicott Company has installed plants for various railroads such as the Union Pacific and the C. B. & Q., and for various industrial establishments. One concern is referred to as having saved 17 per cent. of its fuel by its use. The cost of operation is said to be 4.6 mills per thousand gallons. In some places these machines are removing 1,000 pounds of incrusting material daily.
S. P. SADTLER.

The New Specifications for Asphalt Paving in New York. *Eng. Rec.*, May 17, 1902, p. 460.—These specifications have been drawn with care so as to treat impartially all reliable grades of asphalts. We reproduce the most important parts of the descriptions.

The Pavement Mixture.—The permanent mixture for the wearing surface shall be composed of: 1. Asphaltic cement (refined asphalt, heavy petroleum oil or liquid asphalt). 2. Clean sharp sand. 3. Finely powdered inorganic dust.

(*a*) *Asphalt.*—The term asphalt shall be construed to signify any natural (mineral) bitumen, liquid or solid, which is adhesive, viscous, ductile, and elastic, or which becomes adhesive, viscous, ductile, and elastic, on the application of heat. Said natural bitumen may be either in state of purity or in admixture with native non-bituminous matter.

(*b*) *Refined Asphalt.*—The refined asphalt shall be obtained by refining crude asphalt until the product is homogeneous and free

Digitized by Google

from water. Not less than 60 per cent. of the pure bituminous matter of the refined asphalt shall be soluble in boiling Pennsylvania petroleum naphtha (b. p. 40°–60° C.), or if the refined asphalt does not contain 60 per cent. of its pure bituminous matter thus soluble but is otherwise satisfactory, the deficiency may be supplied by fluxing with such per cent. of liquid, viscous asphalt of paragraph (*c*) as the engineer may require.

(*c*) *Heavy Petroleum Oil.*—This shall be a petroleum from which the lighter oils have been removed by distillation without cracking until it has a specific gravity of 18°–22° B., and the following properties: (1) flash test of not less than 300° F. (New York State closed oil tester); (2) fire test of not less than 350° F.; (3) no appreciable amount of matter volatile under 250° F.; (4) the matter volatile at 350° F. in twenty-four hours shall be less than 8 per cent; (5) free from coke and all forms of adulteration.

Liquid asphalt, maltha, or other softening agent fulfilling above tests and approved by the engineer may be used in place of the heavy petroleum oil. Wearing surface mixture—the matter soluble in carbon disulphide shall not be less than 9½ or more than 12 per cent. When rock asphalts are used, the limits can be 9 to 12 per cent. of bitumen soluble in carbon disulphide. In the bitumen extracted by carbon disulphide from the finished pavement not less than 65 per cent. shall be soluble in boiling Pennsylvania petroleum naphtha boiling between 40° and 60° C. S. P. SADTLER.

The Coal Resources of the Pacific. By HARRINGTON EMERSON. *Eng. Mag.*, May, 1902.—Without counting the coal deposits of Chili, which are not of a satisfactory quality, we have as we go up the Pacific coast, first the deposits of Coos Bay, Oregon, of which the output in 1900 was 104,294 tons. It is the poorest of all the Pacific commercial coals. North of Coos Bay in Puget Sound, and near the cities of Whatcom, Seattle and Tacoma in the United States, and at Comox and Wellington on Vancouver Island are very extensive coal fields, and these are to-day the most important on the Pacific. They have such advantage of location that the better and more easily mined coal of the Crow's Nest on the west slope of the Rocky Mountains in British Columbia 500 miles inland, nearly 800 by railroad, can scarcely compete. In 1901, the output of the American mines was 2,504,190 short tons and the output of the Canadian mines in British Columbia, including the Crow's Nest (about 300,000 tons) was 1,712,715 tons. Exclusive of Vancouver Island, the Puget Sound coal basin covers an area of about 750 square miles.

Westward from Puget Sound along the coast, no coal seams of commercial value are met with until the headwaters of the Yukon River are reached. Near the White Pass Railroad in lat. 61°,

Digitized by Google

long. 135°, a very valuable coal mine has recently been discovered. Westward along the coast there are also outcroppings at Libuya Bay, at Yakutat, and on the flanks of Mt. St. Elias, but the one promising to be of the most commercial importance is near the Chilkat River between Mt. St. Elias and the Copper River in lat. 60° 20′, long. 144° 30′. The coal is extraordinarily good and clean, with 13.79 per cent. of volatile matter, 82.36 per cent. of fixed carbon, 3.08 per cent. of ash. The next commercial occurrence is in the Kenai Peninsula at Cook's Inlet and still west of this the greatest and most extensive coal field in Alaska in two harbors on the Pacific coast and one on Behring Sea. These are known as the Chignick-Unga-Herendeen Bay coal measures and are in lat. 55° 30′ to 56° 30′, long. 158°–161°. The calorific value of a sample of this coal, as determined at the Pittsburg Testing Laboratory, was 12,692 B. T. U. S. P. SADTLER.

AGRICULTURAL CHEMISTRY.

Lands of the Colorado Delta in the Salton Basin. By F. J. SNOW, E. W. HILGARD, AND G. W. SHAW. *Cal. Agr. Expt. Sta. Bull. No.* 140, 51 pp.—This is a report upon a study of the soils and agricultural conditions and possibilities of a portion of the Salton Basin. The area explored embraces about 400,000 acres. The two extreme typical classes of soil found were a hard compact clay containing about 30 per cent. of colloidal clay and over 60 per cent. of very fine silt; and a silt or loam soil containing about 60 per cent. of medium to coarse silt and 10–15 per cent of very fine silt. In experiments in long glass tubes water percolated to a depth of 3 feet in the silt soil within eighteen hours, while in the clay soil 165 days were required for the water to reach the same depth. The capillary action of the clay and the silt soils for the first few hours bore a ratio of 1 to 10. The water-holding power of the clay soil was 30 per cent. greater than that of the silt. Chemical analyses of the soils showed as a rule high intrinsic fertility. A variable but generally high percentage of alkali was found. Analyses of waters with reference to their use in irrigation in the district are reported, and methods of irrigating alkali lands, the climate of Salton Basin, etc., are discussed. A supplement to this bulletin contains notes by J. B. Davy on the vegetation of this region. H. W. LAWSON.

The Cowpea and the Velvet Bean as Fertilizers. By J. F. DUGGAR. *Ala. Agr. Expt. Sta. Bull. No.* 120, pp. 123–179.—Some fifty experiments were conducted at the station during a period of five years to ascertain the value of cowpeas and velvet beans as means of improving the soil. The amount of nitrogen contained in the entire growth of cowpeas in three experiments was found to average 70.2 pounds per acre and in the roots, stubble,

Digitized by Google

and fallen leaves after the removal of the hay 19.75 pounds per acre. As compared with the yield of crops where no leguminous plants had been grown, plowing under cowpeas or velvet beans increased the yield of the first crop of seed cotton on an average 567 pounds per acre; corn, 12.3 bushels; oats, 17 bushels; wheat, 5.65 bushels; and sorghum hay, 2.1 tons; and plowing under the stubble after the vines had been utilized for hay increased the yield of seed cotton, 208 pounds per acre; corn, 4.3 bushels; oats, 28 bushels; wheat, 6.7 bushels; and sorghum hay, 2.08 tons. Cowpeas and velvet beans had practically equal value. The fertilizing value of the vines as shown by the second and third crops, after plowing under was greater than that of the stubble, especially on stiff soils. The effect of leguminous vines is considered as permanent as that of stable manure. H. W. LAWSON.

Grass Experiments. By H. J. WHEELER AND G. E. ADAMS. *R. I. Agr. Expt. Sta. Bull. No.* 82, pp. 125–140.—The results of experiments in top-dressing grass lands were unfavorable to the use of a single fertilizing ingredient. The following fertilizer formula is suggested for this purpose: Acid phosphate, 400 to 500 pounds; muriate of potash, 250 to 300 pounds, and nitrate of soda, 350 to 400 pounds. The manurial ingredients removed from the soil by 1,000 pounds of field-cured hay containing no clover were found to be 5.6 to 5.8 pounds of nitrogen, 14.7 to 16.2 pounds of potash, and 3.3 to 3.5 pounds of phosphoric acid. The importance of chemical manures for grass is considered emphasized by the results of the experiments. H. W. LAWSON.

Sugar-Beet Investigations in 1901. By J. W. AMES. *Ohio Agr. Expt. Sta. Bull. No.* 132, pp. 53–72.—This includes analyses of 216 samples of sugar-beets grown in variety and fertilizer experiments in eleven counties of the state. The average percentage of sugar for the entire state was 12.8 and the coefficient of purity 81.2. H. W. LAWSON.

Pennsylvania Sugar-Beets in 1901. By WILLIAM FREAR AND W. F. CARTER. *Pa. Agr. Expt. Sta. Bull. No.* 59, 8 pp.—The average sugar content of 31 samples of sugar-beets as determined at the station was 15.76 per cent: and the coefficient of purity 84. H. W. LAWSON.

Composition of Nitrogen-free Extract Matter in Potatoes. By C. H. JONES AND B. O. WHITE. *Vt. Agr. Expt. Sta. Rep.*, 1901, pp. 209–216.—Analyses of the nitrogen-free extract matter of 32 samples of potatoes of the crop of 1898 and of 42 samples of the crop of 1899 are tabulated. The samples were taken at different intervals during the growing season and represented two varieties. The nitrogen-free extract constituted about 80 per cent. of the dry matter. The average composition of

Digitized by Google

marketable potatoes of the crop of 1899, calculated on the basis of original substances, was as follows: Moisture, 79.41; crude ash, 1.26; crude protein, 2.28; crude fiber, 0.36; reducing sugars, 0.09; dextrin and soluble starch, 1.35; starch, 14.51; ether extract, 0.06; and undetermined, 0.68 per cent. H. W. LAWSON.

Composition of Nitrogen-free Extract Matter in Artichokes. BY C. H. JONES AND B. O. WHITE. *Vt. Agr. Expt. Sta. Rep.*, 1901, pp. 217–219.—Fourteen samples of artichokes representing several stages of growth were analyzed. The average composition of six samples taken in November was as follows: Moisture, 79.59; crude ash, 1.51; crude protein, 2.12; crude fiber, 0.74; reducing sugars, 0.70; sugars calculated as sucrose, 12.05; inulin, 1.92; ether extract, 0.08; and undetermined, 1.29 per cent.

H. W. LAWSON.

Killing Weeds with Chemicals. BY L. R. JONES. *Vt. Agr. Expt. Sta. Rep.*, 1901, pp. 247–251.—As a result of experiments during three seasons the author recommends the arsenical compounds over salt, copper sulphate, potassium sulphide, kerosene, carbolic acid, or sulphuric acid for immediate action and lasting effect in removing weeds from gravel walks, tennis courts, and similar places. Henderson's fluid weed destroyer is ranked first as regards convenience of use and persistence of effect. The cost of treatment is 40 cents per square rod where 8 gallons are applied. Arsenate of soda is ranked second. One pound is dissolved in 8 gallons of water and applied per square rod. The cost of treatment is 11 cents. Crude carbolic acid applied at the rate of 1 quart in 8 gallons of water per square rod is recommended for destroying weeds where it is desired to grow useful plants as soon thereafter as possible. H. W. LAWSON.

Testing Babcock Milk and Cream Bottles. BY C. H. JONES. *Vt. Agr. Expt. Sta. Rep.*, 1901, pp. 222–223.—The author's method of testing glassware used in creameries and cheese factories is outlined, and an instrument devised by him for determining the uniformity of bore of the neck of the bottle is described.

H. W. LAWSON.

Organic Nitrogen Availability of Fertilizing Materials. BY C. H. JONES AND B. O. WHITE. *Vt. Agr. Expt. Sta. Rep.*, 1901, pp. 219–221.—Determinations of the nitrogen availability of a large number of samples of fertilizing materials as shown by the alkaline permanganate method are tabulated. As this method is not satisfactory for cottonseed meal it is suggested that fertilizers showing an availability of less than 50 per cent. may then be treated by the pepsin digestion method. In Vermont, however, where cottonseed meal is rarely met with in fertilizers, no brand has been examined during four seasons which showed a low avail-

Digitized by Google

ability by the alkaline permanganate method and a high availability by the pepsin method. H. W. LAWSON.

Fertilizers. *La. Agr. Expt. Sta. Bull. No.* 65, *2 series; Mass. (Hatch) Agr. Expt. Sta. Bull. No.* 81; *N. H. Agr. Expt. Sta. Bull. No.* 88; *Vt. Agr. Expt. Sta. Bull. No.* 92; *W. Va. Agr. Expt. Sta. Bulls. Nos.* 79 and 80; *Purdue Univ. Special Bull.*, April, 1902; *N. C. Bd. Agr. Bull.*, April, 1902.—These bulletins include analyses of miscellaneous fertilizing materials. A general discussion of the sources and composition of fertilizers by B. H. Hite is given in West Virginia Station Bulletin No. 80.
H. W. LAWSON.

Feeding Stuffs. *Conn. (State) Agr. Expt. Sta. Bull. No.* 138; *Me. Agr. Expt. Sta. Bull. No.* 80; *Vt. Agr. Expt. Sta. Bull. No.* 91.—Analyses of commercial feeding stuffs inspected in 1901.
H. W. LAWSON.

Miscellaneous Analyses. BY C. H. JONES AND B. O. WHITE. *Vt. Agr. Expt. Sta. Rep.*, 1901, pp. 223–226.—Analyses of 19 samples of materials furnishing nitrogen, phosphoric acid, or potash, 13 of wood ashes, 6 of home-mixed fertilizers, 5 of muck, and 4 of feeding stuffs. H. W. LAWSON.

Miscellaneous Chemical Analyses of Feeds, Foods, Grains, Fruits, Insecticides, Fertilizing Materials, Limestones, and Mineral Waters, 1892–1901. BY A. D. SELBY AND J. W. AMES. *Ohio Agr. Expt. Sta. Bull., No.* 127, pp. 175–218.

PATENTS.

FEBRUARY 4, 1902.

692,268. Nicholas M. Goodlett, Jr., South Orange, N. J., ancillary executor of John Fordred, deceased. Assignor to the Condensed Egg Syndicate, Limited, London, England. **Preserving eggs.** Adds to egg contents 66 to 100 per cent. sugar, heats the mixture to between 165° and 200° Fahrenheit till 10 to 15 per cent. of water has been evaporated.

692,283. John N. Harris, South Norwood, England. **Refining oils.** Heats the oil to between 110° to 130° F., adds a chemical purifier as animal charcoal and chalk both powdered, allows the mixture to stand till settled, then draws off the oil and aerates it in the presence of methyl alcohol.

692,298. Ernst W. Juntner, Stockholm, Sweden. Positive **electrode** for accumulators with constant electrolyte. Fuses silver chloride, removes the chlorine by using the mass as cathode with an alkali metal hydroxide in an electrolytic cell, and oxidizes the resulting silver by using it as an anode in a similar cell.

Digitized by Google

692,310. William J. Knox, Edgewood Park, Pa. Assignor to George Westinghouse, Pittsburg, Pa. Treating **copper ores.** Melts the matte and forces air through it to oxidize iron and sulphur, forming iron oxysulphides and liberating heat, which maintains the bath in a liquid state until the sulphide of copper separates out by gravity.

692,358. David Rouse Jones, Birmingham, England. **Detergent.** Washing soda 20, whiting 50, borax 6, kieselguhr 10, resin 6 pounds, and rouge 4 ounces.

692,437. Gotthold Fuchs, Biebrich, Germany. Assignor to Kalle and Co., same place. **Hydrochloride of cinnamyl quinine.** Reacts with cinnamyl chloride on quinine free from water of crystallization; the product is a tasteless compound melting at 235° to 236° C., difficultly soluble in water, easily soluble in alcohol and crystallizing in white needles.

692,450, -451, -452, -453, and -454 are all to John A. Just, Syracuse, N. Y. Assignor of one-half to D. H. Burrill and Co., Little Falls, N. Y. The first is for an **adhesive** of casein and an alkaline salt of tannic acid, the second, third, and fourth for **baking-powders** of casein and phosphoric acid or a phosphate with an alkaline carbonate, and the last for **casein phosphate** made by adding casein to aqueous phosphoric acid, concentrating, adding more casein and drying.

692,497. Maximilian C. L. Althausse, Billwarder an der Bille, near Hamburg, Germany. Assignor to Fabrik Chemischer Preparate, von Dr. Richard Sthamer, Hamburg, Germany. **Acetyl cellulose.** Treats hydrocellulose with glacial acetic acid and acetyl chloride, the product being acted on by sulphuric acid at 60°–70° C., and then precipitated with water.

692,531. Ernest A. Le Sueur, Rumford Falls, Me. **Electrolytic cell.** The cathode is a horizontal reticulated amalgamated metallic sheet, one side receiving the alkaline metal and maintained in contact with the solution to be decomposed, the other side in contact with a body of water into which the said metal is discharged, and having means for supplying fresh mercury to said sheet to maintain the mercury free from impurities so as to decompose the salts of the alkaline metals.

692,539. Hermann Niewerth, Berlin, Germany. **Reducing ores.** Heats the ore and two bodies of carbonaceous material, forces a hot reducing gas from one body into the ore to reduce it and returns the gas back to the carbon for regeneration and applies the gas from the second body of carbon in the same way till the reduction is complete.

692,588. William C. Alpers, Bayonne, N. J. **Sodium sulpho-**

Digitized by Google

guaiacolate. Acts on guaiacol with sulphuric acid to make a thick red mass, adds calcium carbonate in excess giving calcium sulphoguaiacolate, filters off precipitated calcium sulphate, and adds sodium carbonate to throw down calcium carbonate, and leaves sodium sulphoguaiacolate in solution still containing some calcium salt, then separating the two guaiacol salts and obtaining sodium sulphoguaiacolate in crystalline form.

692,598. Albert Baur, Mulhouse, Germany. Assignor to Fabriques de Produits Chimiques de Thann et Mulhause, Thann, Germany. Process of **separating orthotoluene sulphochloride.** Separates orthotoluene sulphonic acid from its sulphuric acid solution by a little water at low temperature, changes the acid to a metallic salt, and reacts on said salt at 15° to 18° C., with chlorsulphonic acid. The salt may be magnesium salt.

692,627. Bee B. Clawson, Oakland, Cal. **Hydrocarbon composition.** Asphalt, 100; bituminous rock, 300; gilsonite, 100; sand, 50; and litharge 5 parts.

692,634. Herman Davis, Dayton, Nev. **Obtaining precious metals.** Applies chlorine to substances containing said metals, removes a part of the chlorine by air-blast, then leaches out the metallic chlorides by an alkaline cyanide.

692,656. Carl Harries, Berlin, Germany. Assignor to Chemische Fabrik auf Aktien, vorm. E. Schering, same place. **Acidyl derivative of unsymmetrical acetonalkamines.** Oily bodies, insoluble in water, decomposed on boiling with alkali into the respective alkamine base and a salt of the acid originally introduced in the molecule, and adapted to combine with organic and inorganic acids to form salts with anesthetic properties. Produced by reduction of the unsymmetrical base of the triacetonalkamine series, heating the product with an alkylate, thus producing a stable modification of the base and substituting therein an acidyl group for the hydrogen of the hydroxyl by treatment with an acidyl reagent, preferably after forming a salt.

692,675. Paul Julius and Akim Tkatsch, Ludwigshafen, Germany. Assignors to the Badische Anilin und Soda Fabrik, same place. **Violet diazo dye.** Combines orthodiazophenol-*m*-sulpho acid with 1-8-aminonaphthol-4-sulpho acid; the dye is soluble in water red-violet, which reddens on adding hydrochloric acid, but turns blue with sodium carbonate, dyeing wool violet, which blackens on treatment with bichromate and blues on treatment with copper sulphate.

692,676. P. Julius and Fritz Gunther, Ludwigshafen, Germany. Assignors to the Badische Anilin und Soda Fabrik, same place. **Violet disazo wool dye.** Combines tetrazodiamino-*p*-hydroxybenzylsulphonic acid, 1 molecule, with 2 molecules of

Digitized by Google

β-naphthol, the dye giving a blue-violet solution in strong sulphuric acid and that on dilution becomes wine-red.

692,677. Karl Klic, Vienna, Austria-Hungary, and Oscar Poppe, Rixdorf, near Berlin, Germany. **Inlaid linoleum.** Pieces united by a cement of oil and resin mixed and oxidized together and reduced to a proper consistency by a volatile solvent as alcohol, benzene, or carbon disulphide, finally ground to an emulsion.

692,688. Maurice Meslans, Paris, France. Electrolytic apparatus for making **fluorine.** A copper partition separates the anode and cathode cells, such partitions being connected to the anode and having openings below the surface of the electrolyte but imperforate above it.

692,720. Paul Seidel, Ludwigshafen, Germany. Assignor to the Badische Anilin und Soda Fabrik, same place. **Indigo paste.** Indigo, 20 per cent.; gum and water, $^1/_5$ per cent. each. The paste does not deposit a precipitate of indigo.

692,760. Max Bazlen, Ludwigshafen, Germany. Assignor to the Badische Anilin und Soda Fabrik, same place. Process of making **hydrosulphites.** Adds to the bisulphite used a quantity of sulphurous acid equal to one-half that contained in the bisulphite, reduces the mixture with zinc dust and treats the resulting liquid with milk of lime.

692,762. Rena Bohn, Mannheim, Germany. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. **Blue sulphonated dye.** Obtained by fusing a β-aminoanthraquinone body with caustic potash and maintaining a sulpho group attached to the molecule, soluble in 96 per cent. sulphuric acid olive-green, and in fuming sulphuric acid brown-red, in its reduced form dyeing cotton red-blue, and, when oxidized, dyes wool green-blue.

692,770. Antonio Delgrande, Petersburg, Va. **Pyrotechnic compound.** Picric acid, 20; saltpeter, 70; magnesium carbonate and dissolved glue, 5 each; Paris green, 3, and powdered gunpowder, 4, with sufficient water to make a paste which is then dried.

692,775. Maximilian C. L. Althausse, Billwarder an der Bille, near Hamburg, Germany. Assignor to the Fabrik Chemischer Preparate, Dr. Richard Sthamer, Hamburg, Germany. **Cellulose lakes.** Combines an acetyl derivative of hydrocellulose with a suitable organic dye, dilutes the mixture and salts out with common salt. Said lake is insoluble in water after drying and is transparent in thin layers.

FEBRUARY 11, 1902.

692,863. Joseph Koetschet, St. Fons, France. Assignor to

Digitized by Google

Société Chimique des Usines du Rhone, Lyons, France. **Substituted sulphinide.** The process of preparing *p*-aminobenzoic sulphinide by boiling *p*-nitro-*o*-toluene sulphinide in a solution of sulphur in alkali, acidifying and extracting the resulting precipitate.

692,961. Alfred Wolf, Paris, France. Compound for **indurating porous materials.** Rosin and stearine equal parts, with a little bitumen, benzoin and creosote.

692,979. Clemens O. Brueckner, Fort Wayne, Ind. **Purifying water,** by treating it successively with soda-ash, 15, lime, 23, and sodium phosphate, 7 grains to five gallons of water.

693,035. Pierre L. E. Laderlin, Chedde, France. Electrolytic manufacture of **chlorates** and **perchlorates.** Adds chromic acid to a solution adapted to yield chlorates, passes an electric current from an anode to a cathode through said solution while maintaining the chromic acid as bichromate, cooling and crystallizing out the chlorates or perchlorates.

693,148. Elizabeth B. Parnell, Carshalton, England. Treating **refractory ores,** by oxidizing them with chromic acid, roasting them and boiling them in water under pressure.

693,207. John and Sydney Andrews, Belfast, Ireland. **Bleaching flour,** by passing the same in a state of fine division through an atmosphere of, or containing a small quantity of, nitrogen peroxide.

693,316. Leberrecht Tralls, Charlottenburg, Germany. Assignor to Edward Burmeister, Hamburg, Germany. **Purifying sewage.** Adds a mixture of equal parts calcium hydroxide and carbonate, sufficient to produce a heavy precipitate of large flakes leaving the supernatant liquid clear.

693,349. Mordecai H. Fletcher, Cincinnati, O. Assignor to the Vegetol Company, same place. **Dentifrice.** Cereal matter as corn meal and small portions of sodium borate and potassium chlorate.

FEBRUARY 18, 1902.

693,378. Emil Courant, Berlin, Germany. **Triple salt,** containing a double cyanide, *viz.*, a cyanide of an alkaline metal, and another salt of the same metal, as an oxide, with a cyanide of a different metal, as silver. The compound is produced by reacting with a metallic oxide on an alkali cyanide, and subjecting the product to the action of an acid, as hydrochloric acid.

693,408. Jules H. Lavollet and Gustave E. Bourgoin, Paris, France. **Making sugar.** Maintains in suspension in the saccharine juice a powdered mixture of an alkaline earth manganate

Digitized by Google

and calcium fluoride and passing an electric current, then adding an alkali earth carbonate.

693,482. Edward G. Acheson, Buffalo, N. Y. **Reducing ores,** by mixing with the pulverized ore graphite to coat the particles, and in the theoretical proportions necessary for reduction, and passing the electric current through the mixture.

693,485. Edward W. Ayres by Sallie Peyton Ayres, Executrix, Washington, D. C. **Alimentary product.** Soaks, cooks, cools and dries a cereal grain, mixes with it malt and pepsin, then flakes the mixture, dries in a current of air at 135° to 145° F., and finally cooks the mixture. The product is in thin crisp flakes with a maximum of dextrin and peptones.

693,547. Frederick W. Jones, Berwick near Ware, England. **Gunpowder.** Granulated gelatinized gunpowder, each grain having a coating of carnauba wax, and an outer glaze of powdered graphite.

693,548. Same as above, but for the process of mechanical mixing.

693,556. Philip Levi, New York, N. Y. **Composition for polishing.** Distilled water, 14; paraffin oil, 80; refined carbon oil, 6 gallons; butter of antimony, 2; alkanet root, 10 pounds; oil of mirbane sufficient for odor.

693,632. Arthur Weinberg and Richard Herz, Frankfort-on-Main. Assignors to Leopold Cassella & Co., same place. **Blue sulphur dye.** Heats *p*-dialkylamino-*p*-oxydiphenylamine with sulphur and alkaline sulphides, dissolves, melts in water, precipitates by acids, redissolves in dilute mineral acids and filters and then oxidizes. Dyes unmordanted cotton bright blue.

693,633. Same as above, but uses as precipitant metallic chlorides that form soluble sulphides.

693,653. Adolf Kertesz, Frankfort-on-Main. Assignor to Leopold Cassella & Co., same place, Germany. Process of **dyeing** sulphur colors by treating them after dyeing with acids and alkaline acetates.

693,670. Karl Schirmacher, Soden, Germany. Assignor to Farbwerke, vorm. Meister, Lucius and Bruning, Hochst-on-Main, Germany. **Disazo wool dye.** Tetrazotizes *o-p*-diaminophenol-*o*-sulphonic acid and combines with two molecules of β-naphthol; the dye is difficultly soluble in water, blue, and dyeing wool brown shades that become black on treatment with bichromate.

693,697. Charles Friedman, Philadelphia, Pa. Assignor to Edgar A. Bancroft, Trustee, Chicago, Ill. **Creosoting wood,** by

Digitized by Google

mixing creosote at a temperature of 125° F. with a viscid vehicle having a glue base, and a chromium salt to react thereon, and forcing the mixture into the material to be treated.

693,703. Albert Haagen, Cologne, Germany. **Ferro-chrome color.** Makes an alkaline solution of a chromium salt as potassium bichromate and reacts on it with a soluble compound of iron like ferric chloride, the product containing a high percentage of a potassium chromate, and being of a brilliant yellow.

FEBRUARY 25, 1902.

693,906. Eduard Rott, Dassel, Germany. **Artificial stone.** Mixes clay, lime and water to a dough, the lime being 30 per cent., and then steaming the mixture at about twenty-five atmospheres in a closed vessel.

693,982. Robert McKnight, Philadelphia, Pa. Assignor to Metallic Condense Co., of Delaware. **Reducing carbonaceous ores.** If containing precious metals and carbonates of baser metals, they are heated in presence of sulphur and an alkaline haloid till the carbonic radical is removed and the sulphur combines with oxygen and with the alkaline metal, and the liberated halogen unites with the precious metal and volatilizes.

694,014. Emil Helbing, Hamburg, Germany. **Artificial wood.** From washed turf retaining the natural fiber and treated with calcium hydroxide and aluminum sulphate, then pressed in molds.

694,034. Karl F. F. G. Sommer, Hamburg, Germany. **Rapid tanning process.** Treats skins in a bath of chrome and picric acids, also in a bath of potassium bichromate, 240; sodium chloride, 125; alum, 220; and water, 3000 parts.

694,045. Robert H. Willis, Chicago Ill. **Adhesive cement.** Swells glue in cold water, then heats and adds to a mixture of crude turpentine, 4; pine tar, 4; and rosin, 8 parts by weight.

694,081. Joseph B. Weiss and Louis C. Anderson, Franklin, Ohio. Apparatus for **saturating liquids with gases.** The liquid is led into a rose sprinkler which delivers the spray downwards, and the gas supply pipe is led through the middle of the sprinkler opening just beneath it.

694,085. Ella K. Zingg, Great Valley, N. Y. Administratrix of Hermann Zingg, and assignor of one-half to Mary C. Pitts, Salamanca, N. Y. **Paint oil.** Gum, 42; boiled linseed oil, 25; and petroleum 33 parts by volume. The "gum" is a mixture of sodium resinate and rosin.

W. H. SEAMAN.

Digitized by Google

REVIEW OF AMERICAN CHEMICAL RESEARCH.

VOL. VIII. No. 9.

WILLIAM A. NOYES, Editor.

REVIEWERS:

M. T. Bogert, E. M. Chamot, B. S. Cushman,
Benton Dales, L. M. Dennis, A. H. Gill,
H. M. Goodwin, W. F. Hillebrand, L. P. Kinnicutt,
H. W. Lawson, H. N. McCoy, A. A. Noyes,
J. W. Richards, S. P. Sadtler, J. O. Schlotterbeck,
W. H. Seaman, F. P. Underhill.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

The Nature of Volcanoes. BY N. S. SHALER. *North American Review*, 174, 730–741.—This is the most lucid statement the reviewer has seen of the probable prime cause of volcanic outbursts, namely, the action of imprisoned water passing into steam when opportunity offers for its escape. The author had an opportunity probably never before afforded to man of witnessing the steam outbursts from and through molten lava in the cone of Vesuvius during a minor eruption in 1882, and that portion of the paper descriptive of these experiences is most thrilling. The imprisonment of the water in the rock miles below the earth's surface is ascribed to the saturation of strata slowly deposited upon great ocean beds, and the high temperature to the natural increase as fresh deposits cover the earliest ones more and more deeply. Hereby is explained the proximity of nearly all volcanoes to great bodies of water. Possible causes are suggested for the destruction of St. Pierre, and one of the lessons drawn from the disaster is "the importance of systematic and extended observations of volcanoes, with a view to an effective foretelling of approaching eruptions." W. F. HILLEBRAND.

Volcanic Dust. BY F. G. WIECHMANN. *Science*, 15, 910.—This brief note contains a very incomplete analysis of a highly magnetic dust which fell on the vessel "Alesandro del Bueno" (date and position not given) about one hundred miles from St. Pierre: SiO_2, 53.34; $Al_2O_3Fe_2O_3$, 30.68; CaO, 10.47; MgO, 4.12; S, 0.17; P, trace. W. F. HILLEBRAND.

Volcanic Dust and Sand from St. Vincent Caught at Sea and the Barbados. BY J. S. DILLER AND GEORGE STEIGER. *Science*, 15, 947–950.—The material first described fell on the steamship "Coya" when 275 miles southeast of St. Vincent, on the night of May 7-8 of this year. The yellowish gray powder

Digitized by Google

consists of grains ranging from 0.3–0.001 mm. or less in diameter, made up of crystal fragments and glass in the proportion of about sixty to forty. Abundant plagioclase, feldspar, pyroxene, and magnetite are the chief mineral constituents that are identifiable. "Opaque white or yellowish gray pumiceous fragments full of gas cavities are common and give color to the mass, of which they constitute nearly twenty per cent. They are supposed to represent the molten material which floated the crystals and contained the explosive energy of eruption, blowing the mass to sand and dust with the relief of pressure." The analysis by Steiger is as follows:

Soluble in water.		Insoluble in water.			
CaO	0.20	SiO_2	57.62	H_2O-	0.41
$(AlFe)_2O_3$	none	Al_2O_3	19.76	H_2O+	0.59
Na_2O	0.08	Fe_2O_3	3.43	TiO_2	0.87
SO_3	0.29	FeO	3.90	CO_2	none
Cl	strong trace	MgO	1.82	P_2O_5	0.17
		CaO	6.25	S	0.11
		Na_2O	3.79	SO_3	none
		K_2O	0.71	MnO	0.08
					100.08

The water-soluble salts are supposed to owe their origin to the action of hydrochloric and sulphuric acids (the latter formed by oxidation of sulphurous or sulphydric acids) on the shattered lime-soda feldspar. Free sulphur was not present, nor could boracic acid be detected. Ammonia was likewise absent.

The second sample of dust and sand fell at the Barbados on the afternoon of May 7th. Its constituents are the same as those of the first sample, but differ in the relative amounts, and the glass comprises less than twenty per cent. of the mass. Both specimens evidently came from the same volcanic source. They bear close analogy with the material ejected from Bogoslav, in Behring Sea, October 25, 1883, and collected at Unalaska, sixty miles away. W. F. HILLEBRAND.

Report of the Clays of Maryland. By HEINRICH RIES. *Part III of Maryland Geol. Survey, Vol. 4*, pp. 203–505.—The first part of this report is general in its nature, treating of the properties, composition, distribution, classification, testing, mining, preparation, and uses of clays and the methods of manufacture of their many products. Its value should not be confined to the State of Maryland. The second part is a detailed study of the various deposits of the State. Numerous analyses, maps, and illustrations supplement the text. W. F. HILLEBRAND.

The Original Source of the Lake Superior Iron Ores. By J. E. SPURR. *Am. Geologist*, **29**, 335–349.—This is a presentation of the author's maturer views on the subject of the origin

Digitized by Google

of the above ores. The article is largely taken up with the nature of the green ferrous silicate originally called by Spurr glauconite, and which is now generally admitted to have been the source of most of the ores, although recently this name has been rejected by Van Hise and Leith because of the absence of potassium. The author discusses the varying composition of acknowledged glauconites, shows that their potassium varies within wide limits, and he is, therefore, not willing to regard its absence as good ground for considering the green granules to be anything else than glauconite, with which they agree most fully, not only physically, but also in their alteration to silica and limonite.

W. F. HILLEBRAND.

Tourmaline Contact Zones Near Alexandria Bay, New York. By C. H. SMYTH, JR. *Am. Geologist*, 29, 377–383.—These form margins along dikes and veins of granite cutting schists on Wellesley Island in the St. Lawrence river. To account for great irregularities of shape, size, and distribution, the author thinks "that the granite magma was forced, unchanged, into the larger fissures of the schists, while, being charged with water vapor and gases, it was subjected to a process of separation, by which the vapors and very fluid products of hydrothermal fusion were injected into the narrower cracks, often wandering far from the main intrusive body. The larger cracks would thus be filled by the more normal granite magma. . . . . The smallest cracks, on the other hand, should show the widest variation from the normal granite." . . . . Both conditions are fulfilled, and, in accordance with the hypothesis, the smallest cracks have relatively the largest tourmaline zones.

W. F. HILLEBRAND.

Geography and Geology of the Black and Grand Prairies, Texas, with Detailed Descriptions of the Cretaceous Formations and Special Reference to Artesian Waters. By ROBERT T. HILL. *Part VII of the 21st Annual Report of the United States Geological Survey*, pp. 666.—The following analyses, collected from different sources, comprise practically all the chemical data of this bulky report: Two of Austin chalk, one from Texas and the other from Rocky Comfort, Arkansas; four of marls from Williamson County; twenty-four of artesian waters.

W. F. HILLEBRAND.

Descriptive Catalogue of the Meteorite Collection in the United States National Museum to January 1, 1902. By WIRT TASSIN. *Rep. U. S. Nat. Mus. for 1900*, pp. 671–698, with three plates. Brief descriptions follow the names.

W. F. HILLEBRAND.

A Newly Found Meteorite From Admire, Lyon County,

Digitized by Google

Kansas. By George P. Merrill. *Proc. U. S. Nat. Mus.*, **24**, 907–913.—Some of its characteristics make this probably one of the most important and interesting finds. Outwardly strongly oxidized by long exposure to atmospheric agencies, the interior structure is most remarkable. Details cannot be given, but the iron, which makes up perhaps one-third of the mass, acts as a cementing material to the much larger amount of olivine, which is shattered and brecciated in a surprising manner. Schreibersite is abundant, troilite and chromite are common, and lawrencite is indicated by the exudation, from polished surfaces, of a green substance which reacts for chlorine and iron and causes tarnishing to such an extent that the specimens had to be paraffined. The meteorite is a pallasite, the third known representative of Brezina's Rökicky group. Five fragments, aggregating 30.000 grams weight, are known to exist. Its coarse nature and the irregular distribution of its constituents precluded the taking of a fair sample, hence no analysis in bulk was made, but Mr. Tassin has analyzed the iron, olivine, and chromite.

Iron.					Olivine.	Chromite.
Fe	93.00	P	0.025	Cr_2O_3	.....	65.49
Ni	6.00	Cu	trace	FeO	13.185	33.00
Co	0.02			SiO_2	39.14	0.50
S	0 03			MgO	47.63	0.40

The iron portion corresponds to 98.273 per cent. nickeliferous iron, 1.645 schreibersite, and 0.082 troilite.

The author says: "I can but feel that a great deal of importance may be attached to the peculiar structural features shown by this meteorite and the association of the metallic constituents. These latter have been plainly introduced since the first consolidation, and subsequent to the shattering of the olivines." Seven fine plates accompany the paper.

W. F. Hillebrand.

METALLURGICAL CHEMISTRY.

The Beaumont Petroleum Field. *Eng. Min. J.*, May 3, 1902.—Up to March 31, 1902, there has been invested in this district $6,576,590. The iron tanks now in the field can hold 4,890,300 barrels of 42 gallons each. The production of oil in 1901 was about 4,190,000 barrels, of which it is estimated that 1,350,000 barrels was lost or wasted. The output of the first three months of 1902 is estimated at 5,000,000 barrels, making a total output of the field to date of over 9,000,000 barrels, of which 4,000,000 barrels was held in tanks on March 31, 1902.

J. W. Richards.

The Production of Iron Ore in 1901. By John Birkinbine. *Iron Age*, May 15, 1902. Advance sheets of the report of the U.

Digitized by Google

S. Geological Survey.—The total production in the United States was 28,887,479 long tons, 83.11 per cent. of which was hematite, 10.44 per cent. brown hematite, 6.27 per cent. magnetite, and 0.18 per cent. siderite. The Mesaba and Vermillion ranges are in Minnesota, and that state ranked first, while Michigan was second and Alabama third. The value of this ore was $49,256,-245; a mean of $1.71 per ton. J. W. RICHARDS.

Blast Furnaces Building in the United States. *Iron Age*, May 15, 1902.—The year of 1903 will witness the starting of at least 18 new furnaces, most of them of 300 to 500 tons daily capacity, increasing our yearly productive capacity for pig iron about 4,000,000 long tons. The production this year will be close to 18,000,000 tons. J. W. RICHARDS.

The Application of Electricity in Steel and Iron Mills. By C. H. HINES. *Elec. World*, May 10, 1902.—Electrical apparatus is now used for cranes, strippers, tables, blowers, chargers, pig casting machines, coal crushers, hoists, pumps, handling ore, coal, limestone; also for time detectors, telephone clocks, automatic indicators, pyrometers, magnetic separators; also in the laboratory for electrochemical analysis, furnaces, ovens, stirrers, grinders; in the works it has even been used for burning out chilled masses of iron. Most of these applications are called on for night and day service, under adverse conditions and frequently handled by unskilled labor. The storage battery, to meet emergency demands, should be introduced. There is also great need of a better controller for this difficult service, to stand the constant reversals and frequent abuse. Motors should be made of 25 per cent. greater capacity than theoretically required. Direct current at 250 volts is most generally used, but alternating current is better. J. W. RICHARDS.

Puddled Iron and Mechanical Means for Its Production. By J. P. ROE. *Iron Age*, May 29, 1902. Paper read before Am. Inst. Min. Eng.—Description of the Roe Puddling Machine, a tilting or rocking furnace fired by crude oil with blast introduced through the trunnions. The bottom is rectangular, 20 feet long by 8 feet 8 inches, the roof is high in the middle, and the whole can be swung as far as 65° from the horizontal. Melted tap cinder is first run in on the bottom, then molten iron from the blast-furnace or mixer immediately after. The furnace is then oscillated, scale is added, the boil commences, and is high and active. As the iron comes to nature, it rolls itself up into one huge 4,000-pound ball, which can be discharged by tilting the furnace, and rolls by its own gravity into a specially designed powerful squeezer. J. W. RICHARDS.

The Jones Mixer Patent. *Eng. Min. J.*, May 31, 1902.—One

Digitized by Google

of the most important metallurgical decisions of recent years is that of the Supreme Court lately given, affirming the validity of this patent. The decision is printed in full in the official gazette of May 27th. The decision is not made so much on matters of detail but on the general validity of the patent, as determined by the fact that Jones achieved what had practically not been done before, since no one had made use of the idea of a reservoir of molten metal, from which it could be drawn as needed, specifically used for mixing metal from different furnaces for the purpose of steel-making. J. W. RICHARDS.

Modifications in Bessemer Practice. *Iron Age*, May 22, 1902. —The scarcity of steel scrap suitable for the basic open-hearth process has forced the new practice of using no scrap at all in the Bessemer converter. There is such a great demand for open-hearth steel that all the scrap steel procurable goes to those furnaces. The result has been the running of Bessemer converters at a lower heat, to make up for the absence of the cooling effect of scrap, and this is obtained by running silicon down to almost 1 per cent. in the pig iron used. By using large converters and blowing fast, the silicon can be used at 1.25 per cent. with perfect satisfaction, and blast-furnace managers have learned how to furnish such metal, by rapid driving. J. W. RICHARDS.

The False Witness of the Test Bar. BY R. BUCHANAN. *Eng. Mag.*, May, 1902.—The writer propounds the query, "Do cast-iron test bars give a true indication of the quality of the castings they represent, and if not, to what extent do they mislead?" Given molten iron of a certain composition, one can alter the casting by varying the casting temperature or the rate of cooling. Greatest general strength is obtained with 0.5 to 0.6 per cent. combined carbon; to produce this, light castings which cool quickly should have high silicon, heavy castings which cool slowly should have low silicon. When test bars are run separately from the casting they are almost invariably cooled quicker than the casting, which gives them greater strength. Two bars, one cast on the casting the other cast separately, gave 17 per cent. greater breaking stress in the latter. The bar run from the casting had combined carbon 0.49 per cent., the bar cast separately 0.45; the heaviest part of the casting had only a trace. Test bars were cast hot from iron for light gray castings; the hottest cast were nearly 40 per cent. stronger than those cast at dull heat. Two bars were cast on a casting, one near the heaviest part of the casting, cooling therefore slowly, and one further away cooled more quickly. The latter had over twice the tensile strength of the former. Separately cast test-bars are always stronger than those cast on the casting, and of the latter the one nearest the heavy part of the casting is always the weakest. The

Digitized by Google

casting itself is most nearly related in strength to the latter. The writer recommends the actual "test-to-destruction" of a certain percentage of the castings, as is done already for car wheels. Where such tests are impossible, the test-bars should be cast *on* the casting itself (in such manner that they can be machined off) and not simply run off the casting.

J. W. RICHARDS.

Nickel Steel and Magnetic Observation. BY C. MARRIOTT. *Elec. World*, May 10, 1902.—The discoveries by C. E. Guillaume, of the International Bureau of Standards, of the very peculiar magnetic properties possessed by nickel steel alloys containing 15 to 25 per cent. of nickel, and not possessed by alloys containing more than 25 per cent., are attracting considerable attention. The alloys with over 25 per cent. are "alterables," in that their magnetic condition alters with the temperature, but is always the same at any given temperature; the alloys with less than 25 per cent. are "inalterables," in that their magnetism may remain unchanged with change of temperature, within certain limits, to experience sudden change, however, at certain critical points, and showing different magnetic conditions at any given temperature between, according as to whether they are being heated or cooled. It is thus possible to choose alloys which will remain non-magnetic or with a constant magnetism at ordinary temperatures, and whose use will simplify amazingly all measurements of terrestrial magnetism and all comparative galvanometric observations.

J. W. RICHARDS.

Production of Nickel and Cobalt in 1901. *Iron Age*, May 22, 1901. Advance sheets of report of U. S. Geological Survey.—The only nickel and cobalt produced in the United States itself, in 1901, were as by-products from the Mine Lamotte, Mo., the matte being refined at Constable Hook and Camden, N. J. There were thus obtained 6700 pounds of nickel, valued at $3,551, and 13,360 pounds of cobalt oxide. There was produced in the same works, 10,497,097 pounds of nickel from imported Canadian matte. The matte imported was 117,364,437 pounds, valued at $1,847,166, and the nickel produced therefrom had a market value between $5,000,000 and $6,000,000. The production of France and Germany is each about half that of the United States.

J. W. RICHARDS.

The Condition of Nickel in Pyrrhotite From Sudbury. BY C. W. DIXON. *Eng. Min. J.*, May 10, 1902.—The pyrrhotite was subjected to magnetic concentration and the non-magnetic portion analyzed. This was found to contain iron, nickel, and sulphur in almost exactly the proportions in which they are found in pentlandite, and the author concludes that the nickel occurs

Digitized by Google

essentially as pentlandite in all the pyrrhotite deposits of the Sudbury District. J. W. RICHARDS.

The Nickel Mines of Northern Ontario. BY A. MCCHARLES. *Eng. Min. J.*, May 17, 1902.—The Victoria mine, of the Mond Nickel Company, furnishes pyrrhotite ore, carrying about 6 per cent. of combined nickel and copper. This company has been operating its reduction plant since the spring of 1901, reducing 150 to 200 tons of ore to high-grade matte daily. The Lake Superior Power Co. has built a railroad to its Gertrude mine, and when the road is completed it will traverse the main nickel range from end to end, and be of great benefit to the region. The capacity of the smelting plant of the Canadian Copper Co. was nearly doubled in 1901; their Creighton mine is the most valuable copper-nickel mine in the world. The new International Nickel Co. controls about half the mines in the district. The experiments of the Nickel-Copper Co., of Hamilton, to treat these ores by a self-roasting process have proved a complete failure.

J. W. RICHARDS.

Mohawkite. *Eng. Min. J.*, May 17, 1902.—About 170 tons of this new mineral have been mined altogether at the Mohawk Mine in the Lake Superior copper region. The mineral is cobaltiferous domeykite. A special furnace plant has been erected to treat it, at a copper works near New York City, where the mineral is now being regularly treated, and the net value of the Mohawkite ore is placed at $75 per ton.

J. W. RICHARDS.

The Nome and Norton Bay Regions of Alaska. *Eng. Min. J.*, May 24, 1902.—A résumé of a 200-page report of the U. S. Geological Survey, giving the prospects and possibilities of mineral output from this region. J. W. RICHARDS.

Mining Conditions in the Nome Region, Alaska. BY A. J. COLLIER. *Eng. Min. J.*, May 31, 1902.—Discusses the present and probable future prospects of this region.

J. W. RICHARDS.

Boundary Mining District, British Columbia. BY W. M. BREWER. *Eng. Min. J.*, May 3, 1902.—Mining and smelting are carried on in this district at less cost than anywhere else in North America. The copper ore is non-sulphurous and self-fluxing, and can be smelted for less than $2 per ton, while the ore is taken out of the enormous ore bodies by quarrying at the surface or by "pillar and stope" system underground at about 75 cents per ton. At the Grand Forks smelter, the smelting furnaces have a capacity of 1,300 tons per day; there are two 30-ton converters, to which the matte pots filled at the furnaces are taken

Digitized by Google

by electric traveling cranes. A reverberatory storage furnace is being built to hold the matte between the furnaces and converters. The production here represents ten to twelve tons of ore treated daily per man employed in the plant. J. W. RICHARDS.

Expense of Mining and Milling Gold Ore in San Juan District, Colorado. BY SPECIAL CORRESPONDENT. *Eng. Min. J.*, May 17, 1902.—The figures are, of course, good only for the district named, but give valuable suggestions as to the relative expenses of mining and treating gold ores. The following costs in cents per ton are based on 54,000 tons of ore: Powder, 11.79; fuses, 1.87; caps, 0.81; candles, 4.43; steel, 0.30; stoping, 1.22; timbering, 47.45; crushing, 8.98; stamping and amalgamating, 27.27; cyanide treatment of sands and tailings, 70.25.
J. W. RICHARDS.

Electrolytic Precipitation of Gold. *Eng. Min. J.*, May 17, 1902.—A recent patent to E. D. Kendall passes a dilute cyanide solution through a mass of carbon fragments packed around a porous cup and connected as cathode of an electric current passing to an anode inside the porous cup, a voltage of 15 being employed. A carbon plate immersed in caustic soda solution is the anode. When considerable gold is thus precipitated, the compartments are emptied of their solutions and a strong solution of cyanide introduced, while the carbon is now used as anode and a silvered plate as cathode inside the porous cell. The gold is dissolved off the fragments and deposited in reguline form on the cathode. Prof. Christy, of the University of California, had previously pointed out the advantage of this general principle of working, collecting the gold on a small fraction of the surface upon which it is originally deposited. J. W. RICHARDS.

A Note on Cupels. BY T. L. CARTER. *Eng. Min. J.*, May 24, 1902.—A lot of new, fine-grained smooth cupels gave low and irregular results because of their porosity. As high a loss as 10 per cent. was noted on cupelling proof gold, and the whole lot of cupels had to be discarded. J. W. RICHARDS.

Treatment of Mixed Sulphide Ores Containing Zinc by Wet Processes. BY W. R. INGALLS. *Eng. Min. J.*, May 3, 1902.—A long and satisfactory discussion of this difficult metallurgical problem, which does not admit of satisfactory condensation. The processes discussed involve two essential steps,—lixiviation and precipitation. The bringing of the zinc into solution may be done in four ways: (1) Roasting at a low temperature so as to produce the maximum quantity of zinc sulphate, which is readily soluble in water. This has never been fully practicable; a conversion of 50 per cent. of zinc sulphide into soluble sulphates is about the best that has been accomplished, the rest remaining as

Digitized by Google

basic sulphate, oxide, and undecomposed sulphide. (2) Roasting sweet, *i. e.*, chiefly to oxide, and leaching out with dilute sulphuric acid. A ton of ore containing 25 per cent. of zinc would need, if thus roasted, 0.5 ton of chamber acid (62 per cent. H_2SO_4) to dissolve the zinc oxide. In some cases, roasting sweet leaves a large part, as much as one-third, of the zinc in a form not dissolved by the acid. This is manifested mostly in case of ferruginous ores, and may be due to the formation of zinc ferrate, $ZnO.Fe_2O_3$. It is possible that mixed sulphide ores can be roasted, by delicate manipulation and modifications in the process, in such manner as to leave no undecomposed sulphide and yet to form no insoluble oxidized compounds, but the proper method has not yet been discovered. (3) Calcining with an alkaline acid sulphate, and subsequent leaching. (4) Heating raw with concentrated sulphuric acid. Little attention has been given to the two last possible methods. The treatment of roasted ore with acid often experiences difficulty from the decomposition of silicates and gelatinization of silica. This can be avoided by using acid no stronger than 10 per cent. H_2SO_4, and working at a proper temperature. Iron may be taken up in such solutions, if excess of acid is used, and may be removed by precipitating by zinc oxide or by heating to 80° or 90° C. a sufficient time and aerating, which brings down insoluble basic iron sulphates on long standing. The lixiviation must be done in agitators and clear solutions obtained by decantation.

The clear solution of pure zinc sulphate being obtained, several methods of handling it are available. One is to boil down to 50° B. and crystallize the sulphate by cooling. The market for this is restricted, and the water in it makes freight rates to market high. Another way is to boil it down dry, and calcine the residue to zinc oxide, the latter being afterwards reduced to spelter. This is, however, a difficult task ; it bubbles as the last of the water is driven off, and the paste sets to a very hard mass which is difficult to handle and requires about 1000° C. to decompose it. Mixing carbon with it makes it decompose at a dull red. Zinc sulphide reacts on it at a comparatively low temperature, giving zinc oxide and undiluted sulphur dioxide. The solution may also be precipitated by milk of lime, but this leaves calcium sulphate in the precipitate ; burnt dolomite is better, because the magnesium sulphate formed is soluble, and so only half as much calcium sulphate is formed. Barium hydroxide would give a precipitate of zinc hydroxide and barium sulphate, an ideal pigment, but the reagent is at present too dear. Calcined magnesite precipitates a high-grade oxide, but is too expensive, and there is not a large market for the magnesium sulphate produced. Attempts to regenerate magnesium from the sulphate have not succeeded.

The reduction of such precipitated oxides to metal is difficult,

Digitized by Google

because of their bulk and density, but the metal produced is of very fine quality. A briquetting of some sort is desirable.

J. W. RICHARDS.

Occurrence of the Rare Metals in the Rambler Mine, Wyoming. BY W. C. KNIGHT. *Eng. Min. J.*, May 17, 1902.—A continuation of the investigations of the ore found in this mine. The platinum in the ore has been proved to occur as sperrylite; some ore has been tested which contained palladium and no trace of platinum. As a whole, the rare metals average three ounces to the ton in the ore of this mine; as high as 12 ounces has been found. When the value is high, the bulk is palladium. Usually, the platinum and palladium occur in about equal proportions, with a very small amount of iridium and osmium. It is probable that the palladium occurs also as arsenide, $PdAs_2$.

J. W. RICHARDS.

Production of Tungsten, Etc., in 1901. *Eng. Min. J.*, May 31, 1902. *From report of J. H. Pratt in Mineral Resources of the U. S.*—There was mined 1221 tons of crude tungsten ore, concentrated to 179 tons, containing 60 to 70 per cent. of tungstic acid, and this selling at an average price of $154.86 per ton. It came principally from Boulder Co., Colo. The demand for molybdenum is also increasing, but not over 15 tons of this ore was mined in 1901, its value varying from $0.10 to $1.10 per pound. There has been some demand for uranium and vanadium ores, and 375 tons of these were mined in 1901, principally in Colorado. The monazite industry is reviving, 748,736 pounds being mined in 1901, worth $59,262, coming mostly from North Carolina.

J. W. RICHARDS.

The Generation of Intense Heat by the Combustion of Aluminum. *Iron Age*, May 22, 1902.—A mixture of powdered aluminum and barium peroxide may be ignited by an ordinary match, and produces a temperature estimated at 3000° C. Powdered aluminum reduces the oxides of many metals, and the above mixture is used as a cap or "starter." Chromium, manganese and titanium and their alloys with iron, can thus be made quite free from carbon. The mixture of iron oxide and aluminum powder, called "Thermit," is ignited in a crucible and the intensely hot iron produced used for welding purposes (Goldschmidt process). The slag prevents the molten iron adhering to the weld. Many miles of rails have thus been welded in Europe. Broken shafts have been similarly repaired.

J. W. RICHARDS.

Recent Developments in Electrochemistry. BY C. P. TOWNSEND. *Elec. World*, May 10, 1902.—A patent issued April 29, to R. Franchot, of Niagara Falls, proposes the manufacture of

Digitized by Google

Paris green by using copper anodes in a mixed electrolyte of calcium acetate and arsenious acid, whereupon the insoluble cuprous aceto-arsenite forms. The anode is enclosed in a linen bag, to retain the precipitate, and to keep it from being destroyed by the hydrogen or calcium hydroxide formed at the cathode. E. Quintaine, of Argentenil, France, in a patent of the same date, proposes to treat tin scrap by using it as anode, against a lead cathode, using a weak current, and a bath formed by gradually adding ammonium chloride and chloride of tin to an acid solution of tin nitrate. August Voelker, of Ehrenfeld, Germany, melts the material for making glass, and refines the glass itself, in an electric furnace. The materials are fed into an arc, which melts them, and the melted material drops into a pot containing two electrodes which send a current through the melt, thereby keeping it hot and rapidly liberating the gas therefrom, while perforated partitions close to the electrodes prevent the glass from being contaminated by fragments of the electrodes. Johann Lühne, of Aachen, Germany, patents a furnace for a similar purpose, the raw material passing between a series of arcs, to melt it, and the fused material passing through a runway in the base of which are embedded conducting bodies through which an electric current is passed, the heat from which makes the glass highly fluid. J. W. RICHARDS.

BIOLOGICAL CHEMISTRY.

A Note on the Influence of Heat on Enzymes. By S. P. BEEBE. *Am. J. Physiol.*, 7, 295–301.—Contrary to the results obtained by Pozerski and Henri (*Compt. rend. Soc. Biol.*, 53, 27), this author finds that under the conditions of experiment recorded, no evidence was obtained of marked changes in the physical character of the enzyme solutions which have been subjected to a temperature of about 40° C. F. P. UNDERHILL.

Cyclic Albuminuria. By WM. E. HUGER. *Johns Hopkins Hosp. Bull.*, 13, 75–81.—Cyclic albuminuria, like the recognized pathological albuminuria, is due to one or perhaps all of three causes:

(*a*) Inflammatory and degenerative changes in the renal structure, as evidenced by the finding of casts. There is every reason to believe that by careful searching, casts will be found far more often than previous reports lead one to believe.

(*b*) Alterations in the quality of the blood which render its serum-albumin more diffusible. There is nothing to prove an inferior diffusibility in these cases, but the patients are almost always anaemic.

(*c*) Alterations in the degree of blood pressure. Here due to a mechanically increased pressure in the renal veins.

F. P. UNDERHILL.

Digitized by Google

Preliminary Communication on the Diastatic Ferment of the Suprarenals. By A. C. Croftan. *Pflüger's Archiv.*, 90, 285–290.—The suprarenals contain two ferments—a maltase and a glucase. The adrenals either manufacture the ferments themselves or else they have the power of retaining the diastatic ferments of the blood and lymph. The presence of these ferments in the suprarenals would seem to indicate that they were in some way concerned in the glycogen-sugar economy.

F. P. Underhill.

On the Power of Sodium Sulphate to Neutralize the Ill Effects of Sodium Chloride. By Anne Moore. *Am. J. Physiol.*, 7, 315–320.—In this reseach tadpoles and mosquito larvae were employed. In most cases, N/8 NaCl was used as the solution to test the neutralizing action of sodium sulphate. It was found that when added to salt, sodium sulphate is as efficacious in prolonging the life of tadpoles and mosquito larvae as calcium chloride. Some general law, either of valency or of the electric charge, governs the effects of ions, and in view of the fact that calcium chloride as well as sodium sulphate is efficacious in neutralizing the ill effects of sodium chloride, it seems probable that the action of sodium sulphate is not a specific effect, but is a response to a general law.

See also: Anne Moore, *Am. J. Physiol.*, 5, 87, and 4, 265.

F. P. Underhill.

On the Contact Irritability of Muscles. By W. D. Zoethout. *Am. J. Physiol.*, 7, 320–325.—If the calcium salts in the muscle are decreased, the efficiency of the potassium ions to increase the tone of the muscle is increased. If the potassium ions are increased, the efficiency of such salts as sodium oxalate and sodium citrate to cause contact irritability is increased. The contact irritability depends (as Loeb suggested) on the disturbance of the normal ratio of salts in the muscle. Perhaps it is the disturbed ratio between the potassium and the calcium salts which makes the contact reaction possible. F. P. Underhill.

The Effect of Certain Poisons on Inorganic Ferments. By Harry Jones. *Johns Hopkins Hosp. Bull.*, 13, 97–101.—Being a review of the work of Bredig and his pupils (see *Zeit. physiol. Chem.*, 31, 258, and 37, 1). The action of certain poisons such as mercuric chloride, hydrogen sulphide, sodium nitrate, etc., upon the inorganic ferments of platinum, gold, silver, cadmium, etc., is very similar to that upon the organic ferments of the animal organism. Bredig regards the colloidal solutions of the metals in many relations, at least, as inorganic models of the organic enzymes.

The author would refer the action of the colloidal solutions of

Digitized by Google

the enzymes and catalysis generally to the *surface energy* possessed by these substances. F. P. UNDERHILL.

Albumin in the Urine, A New Way of Applying Nitric Acid and Other Reagents. BY L. NAPOLEON BOSTON. *N. Y. Med. J.*, 75.—A pipette is filled with from 1 to $1^1/_2$ inches of the urine to be tested. Then the pipette is either carried under a stream of water and the outside dried with a towel or it is freed from all traces of urine with a damp towel. This pipette with its contained urine is placed near the bottom of a bottle containing pure nitric acid and the acid allowed to flow gradually up into the pipette. When the pipette contains as much acid as urine, the finger is pressed firmly over the open end of the pipette. The pipette is removed from the bottle and held toward the light on a level with the eye, and if albumin is present a distinct white cloud in the form of a ring is seen at the juncture of the two fluids. This method is recommended because it takes only a few seconds of time, requires no test-tubes and only a small quantity of acid and urine. F. P. UNDERHILL.

Further Experiments On Artificial Parthenogenesis in Annelids. BY MARTIN H. FISCHER. *Am. J. Physiol*, 7, 301–315.—The experiments upon amphitrite and nereis confirm the views of Loeb that the spermatozoon does not act as a "stimulus" to the egg that starts its development, but simply as a catalyzer that accelerates a process which starts of its own accord. The unfertilized eggs of either amphitrite or nereis, if left undisturbed in sea water, show a dissolution of the nucleus, a deepening in the color and a contraction of the protoplasm, together with a beginning cellular division that correspond to the changes that occur in the fertilized egg, except that they begin at a much later time, and succeed each other much more slowly than in the fertilized eggs. The addition of calcium (in amphitrite) or the abstraction of water (in nereis) from the egg serves only as a method of accelerating a process that occurs anyway. But this accelerated karyokinesis is essential to the further development of the egg, for if left undisturbed in sea water, the egg reaches only the first stages of segmentation and then dies.

F. P. UNDERHILL.

Function of Ferments in the Blood. BY A. C. CROFTAN. *J. Am. Med. Asso.*, May 3, 1902; *Abst. N. Y. Med. Times*, 80, 1082.—The rôle which blood ferments play in intracellular digestion is fully considered in this article.

In reviewing the origin and final destination of such enzymes, the author's experiments show a close connection between them and living protoplasm even in its most "vital" properties. If 0.01 gram pepsin be dissolved in 95 cc. of a 2.75 per cent. solution

Digitized by Google

of hydrochloric acid and 5 grams of fibrin or egg albumin are added, the latter will be dissolved in twenty-four hours and the fluid will become clear. If 10 cc. of this solution be mixed with 85 cc. of the hydrochloric acid solution and 5 grams of fibrin are added, this too, will become clear. This process can be repeated and not until the tenth time will retardation be observed. If the same dilution of pepsin be made without adding fibrin, no solution of fibrin occurs after a dilution of about 1 to 3000 is reached. The process resembles a regeneration of pepsin by contact with fibrin—a growth in a suitable medium, *i. e.*, in the absence of pabulum, no growth takes place.

F. P. UNDERHILL.

SANITARY CHEMISTRY.

The Action of the Septic Tank on Acid Iron Sewage. BY LEONARD P. KINNICUTT AND HARRISON P. EDDY. Third Annual Report of the Connecticut Sewage Commission, pp. 5–32. *Eng. News*, 47, 445–448; *Eng. Record*, 45, 444–445.—This paper gives the results of more than a year's experimental work on the action of the septic tank on sewage containing about ten parts free sulphuric acid and sixteen parts copperas in the 100,000 parts.

The tank was a closed tank made of iron, fourteen feet long and five feet deep, holding, when filled to the height of four feet, 1,762 gallons. The flow of sewage was continuous and so regulated that the time of passage through the tank was eighteen hours.

The experiments were begun in the autumn of 1900, and were continued without interruption for fifteen months. Half-hour samples of the sewage and effluent were taken day and night and at the conclusion of each week aliquot portions of the twenty-four-hour samples were mixed and the resultant mixture analyzed. The amount of gas given off each day was noted and samples of the gas were taken, often daily and always weekly, except during the months of January, February, and August, for analyses. The amount of deposit formed was measured, and its composition as well as the composition of the crust determined. The maximum and minimum daily temperature was recorded and the temperature of the sewage and effluent were taken twice daily, at nine in the morning and at five in the afternoon.

From the results that were obtained, which are all tabulated, the authors have drawn the following conclusions regarding the action of the septic tank in sewage containing free acid and iron salts.

That about one-fourth of the total solid matter is removed by the passage of acid iron sewage through a septic tank. That

Digitized by Google

the amount of soluble matter removed, equaling in Worcester about 21 per cent. of the total soluble matter, is greater than the amount usually found to be removed from a sewage by septic tank action. That the amount of suspended matter removed, found to be about 25 per cent. of the total suspended matter, is very much less than the amount removed by the same process from a sewage containing less manufacturing waste. That the above results are due to the change of the soluble sulphate of iron in the sewage into the insoluble sulphide of iron, and to the fact that a comparatively large amount of iron sulphide is carried out of a septic tank in the effluent. That the action of a septic tank removes a large amount of iron from an acid iron sewage. That the amount of organic matter removed, 26 per cent. in Worcester sewage, is much less than is removed by the same process from an alkaline domestic sewage. That though a greater amount of organic matter seems to be removed from the sewage in the warm months than in the cold months, the results, possibly owing to methods of sampling, show no direct relationship between the organic matter removed and the temperature.

That the amount of gas given off depends greatly upon the amount and character of the sludge at the bottom of a tank, and the amount given off is a measure of the total amount of bacterial action taking place, and is not a measure of the amount of organic matter being removed at any given time from the sewage.

That the amount of gas evolved from a septic tank depends upon the temperature and that it is less in winter than in summer varying from 2–7½ gallons for every 100 gallons of sewage passed through the tank.

That the gas given off from a tank through which acid iron sewage is passing is a mixture of methane, nitrogen, and carbon dioxide; containing little, if any, hydrogen.

That the amount of sludge changed into soluble or gaseous substances, 28 per cent. with Worcester sewage, is probably less than would usually be the case, on account of the large amount of iron sulphide in the sludge.

That the sludge in a septic tank contains less organic matter in the autumn than in the spring.

That the crust contains a much larger amount of organic matter than the sludge.

That the formation, non-formation, and disappearance of the crust on top of the liquid in a septic tank appears to be an incident rather than a result of bacterial action.

L. P. KINNICUTT.

Sewage Purification Plants. BY JOHN W. ALVORD. *Journal Western Society of Engineers*, 7, 113–144 (1902).—A paper illustrated with numerous cuts and diagrams, followed by a discussion, taking up the history and development of septic tanks and con-

Digitized by Google

tact beds, the principles involved in these modern methods of treatment, the advantage of automatic controlling devices, and closing with a comparison between the cost of treating sewage by these methods and by the method of intermittent filtration.

The success of the septic tank treatment, the author believes, depends greatly on the time of passage of the sewage through the tank, the so-called "fermentation period." He describes several new forms of septic tank, constructed under his direction, in which the time required for the sewage to pass through the tank can easily be regulated to suit various conditions and also describes a device to prevent a direct zone of flow between the inlet and outlet.

In comparing the cost of the different methods the author places the amount of sand-bed area required for the treatment of the sewage of a town containing 2,500 inhabitants by intermittent filtration at not less than seven acres if the sand is of medium size, and fourteen acres if the sand is quite fine. If the filling material has to be brought from any distance the cost complete would not be less than $10,000 an acre, making the cost of the plant $70,000 to $140,000. By the use of septic tanks and contact beds he claims that the same amount of sewage could be treated on three-fourths of an acre and even if the filling material was brought from a great distance the plant would cost not more than $16,000, including the septic tank. L. P. KINNICUTT.

Mechanical Filtration of Water. ROBERT E. MILLIGAN. *Journal Western Society of Engineers*, 7, 216–254 (1902).—A very interesting paper on the history and development of mechanical filtration of water supplies, illustrated by numerous cuts. The subjects of coagulants, pressure filters, and various forms of gravity filters are carefully considered.

The use of iron sulphite and lime in place of aluminum sulphate, and the preparation of the iron sulphite at Quincy, Ill., and at Lorain, Ohio, is dealt with at considerable length, and the author expresses the opinion that the present indications are that the iron process is destined to supersede the more expensive sulphate of aluminum process except in cases where peculiar conditions favor the use of the latter. L. P. KINNICUTT.

The Iron Coagulant Process at Lorain, O. *Eng. Record*, 45, 411 (1902).—A description of the preparation and use of iron sulphite in place of aluminum sulphate as a coagulant in the mechanical filtration of water.

The iron sulphite is made by treating scrap iron contained in open tanks, with a dilute solution of sulphurous acid, the dilute solution of sulphurous acid being obtained by passing sulphur dioxide, formed by the burning of sulphur, through a condenser filled with broken stone through which water percolates.

Digitized by Google

The iron sulphite in solution is added to the water together with a calculated amount of a saturated solution of calcium hydroxide.

The bacterial efficiency ranges from 81.82 per cent. when the water contains 242 bacteria per cubic centimeter to 99.12 when it contains 1,868 bacteria.

The cost at Lorain, using iron sulphite and calcium hydroxide, is $1.46 per million gallons; when aluminum sulphate was used the cost was $5.35. L. P. KINNICUTT.

INDUSTRIAL CHEMISTRY.

Creosoting Wooden Poles for Electric Line Work. By W. E. MOORE. *Eng. News*, May 29, 1902, p. 433.—The poles are run on trucks into a steel cylinder, 6 feet in diameter, and 102 feet long with heavy cast-iron heads which can resist a pressure of 150 lbs. per square inch. One-inch steam pipes are laid in the bottom. Live steam is then injected at 80 lbs. pressure and superheated to about 350° F. by the pipes in the bottom. This is continued for from four to six hours. The steam is then shut off and while the superheating is maintained a vacuum is created which quickly boils out all the sap from the wood. The atmospheric pressure is then allowed to fill the cylinder and the pressure-pump is started and with 60 lbs. pressure about two to four hours are required to thoroughly impregnate the timber with "creosote." The cost of treatment is about $20.00 per 1,000 feet board measure, or about $3.50 to $4.00 per pole of average size (34 feet × 8 inches at top). Creosoted poles have been used in England for 30 years without showing signs of decay. S. P. SADTLER.

Fire Tests of Fireproof Floors by the New York Building Department. *Eng. News*, May 29, 1902, p. 441.—These tests were made under the supervision of the Department of Buildings of New York City. The floors to be tested were made of cement composition, embedded in meshes of galvanized wire between I beams 5 feet apart. A fire with a heat of not less than 1700° F. was built below such floor in a specially constructed hut and maintained for a definite period and then water from a hose dashed upon ceiling and floors. The construction of three companies was found to stand the prescribed test.

S. P. SADTLER.

The Possibilities of a Light Weight Storage Battery. By A. L. MARSH. *Elec. World and Eng.*, June 7, 1902, p. 996.—The author very exhaustively sets forth and compares the important chemical and electrical equivalents of various substances that are or might be used in storage batteries. The figures are given for

Digitized by Google

each substance, and the ampere hours and the voltage theoetically deducible (and when it can be stated, as found in practice) in passing from one state of oxidation to another.

S. P. SADTLER.

The Action of Caustic Soda on Wool. BY J. MERRITT MATTHEWS. *Jour. Soc. Chem. Ind.*, May 31, 1902, p. 685.—After referring to the earlier statements on this subject by Mercer, Kertesz, and Buntrock, the writer gives an account of a careful study of this matter by himself and pupils at the Philadelphia Textile School. He finds that whereas with weaker solutions, the wool is turned yellow and even disintegrated, when caustic soda solution of 80° Tw. is used for from five to ten minutes at a temperature of 18° C., the wool is increased in tensile strength, is whitened in appearance and has imparted to it a high luster and a silky feel and scroop. The color is very similar to that of a bleached yarn and what is of importance too, is that the mercerized wool, as it may be termed, has its dyeing qualities notably improved. After removal from the caustic soda, the yarn must be immediately washed in fresh water and then in a 1 per cent. solution of sulphuric acid. The increase in tensile strength as measured by the author was 36 per cent., and of elasticity nearly 80 per cent. When the untreated and the treated wools were examined under the microscope, it was found that the treatment had caused the scales so characteristic of the ordinary wool fiber to fuse together and become obliterated, so that the fiber appears much smoother in outline and more transparent. The fiber is not, however, swollen to any extent so the diameter of the treated and untreated wool was found to be exactly the same. Examined chemically, it was found that the treatment had the effect of removing a large portion of the sulphur of the wool. Untreated wool gave 3.42 per cent. of sulphur, while after treatment the same wool showed 0.53 per cent., showing that the caustic soda had removed 84.5 per cent. of the sulphur originally present in the wool.

S. P. SADTLER.

Automatic Water Purifying Apparatus. *Electrical World*, 39, 782–783 (1902). Unsigned.—A description with cuts of the Reisert-Dervean process of softening and purifying water.

The water to be treated is fed into a conical shaped tank containing lime, the water and lime rise in the tank until the current is so much diminished, owing to the increased cross section of the tank that the particles of undissolved lime settle out, and clear water leaves the tank at the top, through a pipe which passes to the bottom of a second tank, which contains sodium carbonate. The precipitate formed settles out and is drawn off from the bottom of the tank while the water, to remove all suspended matter, is passed upwards through a filter. This filter, by an ingenious

Digitized by Google

device, is automatically washed when it becomes clogged. It is claimed that the only personal attention required is charging the apparatus once a day with lime and sodium carbonate and the opening of certain cocks for the discharge of the precipitate.

L. P. KINNICUTT.

PATENTS.

FEBRUARY 25, 1902.

694,102. Edward C. L. Kressel, London, England. Assignor two-thirds to Thomas Hill Jones, same place. Preparing **alimentary extracts** from yeast. Hydrates the proteid matter of the yeast by superheated steam in a closed vessel which forms soluble peptones, then separates the solid matter and condenses the liquid.

694,139. Frederick J. Corbett, South Yarra, Victoria, Australia. Apparatus for making **white lead** by precipitation. A plurality of settling chambers each having an outer shell, an inner perforated shell, with a lining of filtering material, floats in each settling chamber and valved discharge pipes connecting each chamber below the float with a vacuum pan, the latter having a valved spout and siphon pipes beyond the valve between the spout and the pan, a condensing coil connected with the spout and an air-pump connected with the coil.

694,149. Carl Hoffman, Höchst-on-Main, Germany. Assignor to Farbwerke, vorm. Meister Lucius and Brüning, same place. **Acidyl dialkyl rhodamine.** Condenses dialkylaminooxybenzoylbenzoic acid with acidyl-*m*-aminophenol and obtains an asymmetric dialkyl rhodamine which is a dark red powder insoluble in ether, hardly soluble in water, readily in hot alcohol, the solution being pink red with green yellow fluorescence.

694,301. Adriaan L. De Sturler, Overveen near Haarlem, Netherlands. **Preserving fruits** by treating the surface of the fruit with a gaseous sterilizing agent, then wrapping closely in a paper cover, then dipping the package in a bath of waxy hydrocarbon, whereby the food is effectively sealed but the hydrocarbon does not come in contact with the fruit.

MARCH 4, 1902.

694,348. Geo. C. Carson, Redding, Cal. Apparatus for **treating metals.** A blowpipe or jet composed of hollow carbon, having an internal sleeve split and lapped, forming a reinforcement for said carbon.

694,349. Henry R. Cassel, New York, N. Y. Process of **recovering gold** from refractory ores. Converts the ore into a pulp, adds a salt capable of yielding, by electrolysis, oxidizing and dissolving agents, agitates the mixture and simultaneously electro-

Digitized by Google

lyzes it under such conditions as to oxidize the refractory elements, dissolve the gold and reprecipitate the dissolved gold as a black powder, reversing the current to detach the black powder from the electrodes, and finally adding a solvent as potassium cyanide to redissolve such black powder.

694,350. Apparatus for the above process, to same party. The combination of a vessel with a rotary insulated shaft, metal arms projecting radially therefrom, carbon plates projecting beyond the arms, and a cement filling around the plates and arms.

694,424. Emil Rueff, New York, N. Y. **Compound of magnesia.** Contains magnesia, two molecules to one of carbon dioxide, and more water than magnesia; a bad conductor of sound and heat, and, when pressed and molded, having great strength and elasticity.

694,521. Bastiaan W. Begeer, Florence, Col. Assignor of one-half to Jeremiah M. Hower, Jr., Florence, Col. Cyanide process of **extracting precious metals.** Attaches circulating pipes with pump to opposite corners of a tank, introduces oxygen into the cyanide solution while circulating, and adds the ore.

694,522. Charles S. Bird, Walpole, Mass. **Lining material.** Outer layers of unsized paper, intermediate layers of asphalt uniting the inner surface of the outer layers and filling the pores thereof, and paraffin saturating said outer layers.

694,584. Otto Selg and Carl Guntrum, New York, N. Y. Process of **converting wort into beer.** Adds yeast to the wort in a tub with an upper opening to effect a main fermentation and simultaneous ejection of impurities, separating the main body of the yeast at the bottom of the liquid, leaving a residue of yeast in the tub, which is then closed and fermented by the residual yeast while cooling the upper stratum of the wort.

694,618. Sylvester A. Cosgrave, Pittsburg, Pa. **Compound ingot.** Composed of three parallel layers of steel of different degrees of carbonization, the middle layer being softer than the other two.

694,658. Jules Meurant, Liege, Belgium. Electrolytic process of **coating easily oxidizable metals.** Makes an aqueous solution of metallic chlorides of less oxidizable metals, as zinc or tin, adds a metallic alkaline carbonate, ammonium chloride and gelatine, immerses the body to be coated and a suitable electrode and passes an electric current of not over one volt and one ampere per square decimeter. Has a long list of carbohydrates as additions.

694,688. Erwin S. Sperry, Bridgeport, Conn. **Improving castings** of alloys of copper and zinc. Adds to the alloy while in a molten condition a predetermined quantity of arsenic that will all

Digitized by Google

oxidize out in the pouring and then pouring in the usual manner, the resulting casting being free from arsenic, dross and scale.

694,699. Titus Ulke, Sault Ste. Marie, Canada. **Refining composite metals.** The process of refining nickeliferous copper material by dissolving it, electrolytically recovering the copper under constant conditions, withdrawing a part of the electrolyte and separating the metals therein contained, returning the copper as salt or solution to the original electrolyte and depositing the nickel as a salt or solution while making regular additions of nickel to the bath.

694,728. Howard F. Chappell, Chicago, Ill. **Rosin soap.** Rosin is boiled in a hot soda ash solution; when the reaction is complete the solution is superheated and the finished resinate dried without scorching, having a minimized excess of rosin and soda ash.

694,752. Wm. B. Hughes, Philadelphia, Pa. Making **open hearth steel.** A bath of purified iron is put on the hearth, a highly oxidizing liquid basic slag is made outside of the furnace with iron oxide and lime, a charge of impure iron is added to the hearth and then the slag is introduced and the impurities uniting therewith removed, the carbon reduced to the desired percentage, the temperature raised and a part of the purified metal tapped off, leaving a starting bath for the next run.

694,802. Jacob Steiger, London, England. Making **cement.** Mixes a concentrated hot solution of magnesium chloride with powdered siliceous material, heats, dries and powders, then adds powdered calcined magnesite.

694,859. Alpheus H. Hipple, Omaha, Neb. **Waterproofing asbestos.** Incorporates oil in the fibers of asbestos and compresses it, then vulcanizes.

694,899. John M. Stukes, Snyder, Texas. **Egg-preserving** compound. Cotton-seed oil, one gallon; beeswax and paraffin, each two pounds; and salicylic acid, a half ounce.

694,933. Wm. R. Chipman, New York, N. Y. Assignor of one-half to Max Blumenthal and Frederick G. Kune, Brooklyn, N. Y. **Electrode for purifying liquids.** A compound of metallic magnesium, 20, and aluminum, 40, from which oxyhydrates may be developed by electrolysis, one or more metals as binder and (say tin, 15) another as hardener (as nickel, 5) with a suitable flux, as resin or borax.

MARCH 11, 1902.

694,945. Max Cohn, Berlin, Germany. **Iodine preparations.** Dissolves potassium iodide and gelatinous substances in water, adds iodine, dries and comminutes the mixture.

694,947. Samuel Davies, Iola, Kansas. **Smelting zinc.** Puts

Digitized by Google

a mixture of zinc oxide and non-metallic refractory substances as fire clay in a retort, heats exteriorly, passes a current of hydrocarbon gas through the charge to reduce it, conducts the gas and vaporized metal through a condenser to deposit metallic zinc and allows the gas to escape.

694,989. Henry N. Potter, Göttingen, Germany. Assignor to George Westinghouse, Pittsburg, Germany. **Insulating compound** of soapstone or talc powder in excess, and a binding material as gum tragacanth or water-glass.

695,031. Henry L. Carter, N. Y. **Elastic plaster.** Made of gypsum and small quantities of althea, dextrine, and gelatine.

695,033. Edwin D. Chaplin, Winchester, and Henry G. Halloran, Boston, Mass. Assignors to Henry Dakin, Boston, Mass. Electrolytic production of **chlorine** and **alkaline hydrates.** Supplies the electrolyte below the anode and cathode, completes the circuit through the electrolyte, maintains the lateral separation of the ions by an upright impervious non-conducting barrier, between anode and cathode, withdraws the separated ions and prevents diffusion of the latter into the electrolyte by a horizontal previous diaphragm at the foot of the barrier, and interposed between the anode and cathode, and the incoming electrolyte.

695,037. George Craig, Glasgow, Scotland. Assignor to Robert Morton Paterson, Spiersfield, Paisley, Scotland. Apparatus for making **alkaline cyanides.** Extractors in which material containing cyanogen is treated by liquid ammonia, pipes connecting the extractors, and the last with the first, a branched ammonia supply pipe and suitable valves, whereby the ammonia is passed through the entire series beginning with any desired extractor, and a combined concentrator and condenser with pump to force ammonia from the concentrator through the condenser.

695,123. George E. J. Street, Kingston, England. **Illuminating compound.** Mixes lard oil, 3 parts; neats foot oil, 1 part; and camphor, $^1/_{32}$ part.

695,126. James Swinburne and Edgar A. Ashcroft, London, England. **Extracting sulphide ores.** Passes chlorine through a bath of the ore and a fused chloride, producing free sulphur, the chlorine uniting with the metal of the ore.

695,127. Elihu Thomson, Swampscott, and John G. Callan, Lynn, Mass. Assignors to General Electric Co., New York. **Insulates wire** by a coating of rubber, then coats with cellulose tetracetate.

695,177. Marcus L. Sly, Medina, N. Y. **Treating iron scrap,** by charging a cupola with layers of scrap, iron oxide and alumina, and heating.

695,180. George C. Stone, Jersey City, New Jersey. As-

Digitized by Google

signor to the New Jersey Zinc Co. Cooling and **absorbing sulphuric anhydride.** Passes a current of gas in opposite direction to a current of liquid in pipes of letter S shape, in a cooling tank, and the pipes with transverse dams in the bends.

695,198. Henry V. Dunham, New York, N. Y. Assignor to Casein Co. of America. **Insoluble casein.** Dissolves a mixture of casein and a metallic salt in water, giving an alkaline reaction as borax, 15; casein, 85; water, 400; adds 15 parts of hexamethylene tetramine and dries.

695,209. Thomas Ingham, Liverpool, England. **Alkaline alginates.** Adds to a mixture of alkaline alginate and alkali, alginic acid in the proportions required to form an alginate.

695,210. Thomas Ingham, Liverpool, England. **Briquettes,** made of alkaline alginate as above, and broken stone or similar material.

695,238. Frank Scholl, Höchst-on-Main, Germany. Assignor to Farb-werke, vorm Meister Lucius und Brüning, same place. **Orange-red dye.** Diazotizes substituted orthoaminophenol, and combines the product with 1-phenyl-5-pyrazolone, which is insoluble in alcohol, ether, benzene, and petroleum, readily soluble in water orange-red, in concentrated sulphuric acid clear yellow, and which is an orange-brown crystalline powder.

695,254. Wilhelm Weber, Stollberg II, Germany. Assignor to Chemische Fabrik Rhenania, Aachen, Germany. **Pancreas preparation.** Mixes pancreatin with an alkaline tannin, adds another acid and collects the precipitate.

695,256. William White, Jr., Pittsburg, Pa. **Making steel.** By charging molten metal into a converter, forcing air and steam therethrough, transferring the metal when desiliconized to an open hearth furnace, and subjecting it to the usual or any desired treatment.

695,264. Thomas Andrew, Richmond, and Thomas K. Bellis, London, England. **Making steel.** Heats to open the pores or grain of the steel, and expose the carbon of the same, treats it with a bath of hydrogen, raises its temperature higher and chills it suddenly to fix the carbon.

695,305. Joshua J. Green, Shreveport, La. **Removing fiber** from cotton seed. Heats the seed, distributes strong oil of vitriol over it and stirs or rubs the seed together to remove carbonized fiber, and allow the vitriol to act on the inner coatings, and then washing with water.

695,306. Max M. Haff, New York, N. Y. Assignor to Ampere Electrochemical Co., Jersey City, N. J. **Separating** the constituents of **sulphide ores.** Heats mixed sulphides of zinc and lead with an alkali acid sulphate obtaining sulphates of lead and zinc and sulphur dioxide, making sulphuric acid of the latter,

Digitized by Google

leaching the mixed sulphates with water, to dissolve the zinc and alkaline sulphates, adding barium hydrate to precipitate zinc hydrate and barium sulphate, recovering the alkali sulphate from the solution and acting on it with the sulphuric acid of the first part of the process to make acid sulphate for re-use.

695,348. Robert Steiner, New Orleans, La. **Artificial fuel.** Mixes crude petroleum, 6 per cent. of sawdust and 12 per cent. of earth, distils, and presses residue into briquettes.

695,376. George G. Convers and Arthur B. De Saulles, South Bethlehem, Pa. Production of **zinc dust.** Heats the charge preliminary to effect the distillation of the zinc, conveying off separately the zinc oxide and receiving the metallic zinc vapors directly in a collecting chamber, immediately expanding and collecting them as zinc dust in said chamber and interrupting the flow at the end of the process when oxide of zinc appears.

MARCH 18, 1902.

695,441, Johann J. Brack, Basle, Switzerland. Assignor to Basle Chemical Works, same place. Process of making **phthalein dyes,** by heating one molecule of an alkyl ester of a dialkyl-amino-*o*-oxybenzoylbenzoic acid with one molecule of a *m*-amino-phenol in a mixture of sulphuric and methylsulphuric acid, to over 100° C.

695,474–5–6–7. All to John McFarlane and David C. Reinohl, Washington, D. C. The first for **extracting oil,** the next two for **hulling cotton-seed,** the last apparatus for **separating the kernels.** The seeds with their hulls and lint are treated with a solution of concentrated lye till the hulls open and the kernels separate, washing the kernels with a solution of sodium chloride to remove the lye, and then with water, crushing and extracting the oil from the kernels, agitating the oil with alkali, then with sodium chloride and finally washing.

695,533–4. Both to Anton Bonati, Biebrich, Germany. Assignor to Kalle und Co., same place. **Sulphur dyes.** The first is got by boiling the partial reduction product of *o-p*-dinitro-*p*-oxydiphenylamine with carbon disulphide, and melting the condensation product with sodium sulphide and sulphur. It dyes unmordanted cotton a gray-green that develops to a green-blue by treatment with hydrogen peroxide and stannic chloride. The second is obtained by dissolving the first dye in water with sodium sulphide and sulphur and oxidizing the mixture with an air-blast and precipitating by common salt. Dyed as the first it becomes brighter and a more reddish blue.

695,573. Paul Magnier, Billancourt, and Pierre A. Brangier, Estrees, France. Process of **converting wood, etc., into dextrine,** glucose, and alcohol. Digests wood at 100° C. in water having 2 per cent. of sulphuric and phosphoric acids mixed, heats to a

Digitized by Google

high temperature in a closed digester, neutralizes and passes an electric current through the material, while under pressure, then adds albuminoid substances to the material, ferments and distils.

695,587. Johannes Stocker and Hermann Xander, Berlin, Germany. **Insulating substance.** Forms a mixture of caustic potash, 3; water, 20; ground lardstone to make a paste, and borax $^1/_4$, lets the mixture stand for a time under exclusion of air, adds alum, 2; magnesia, 1 to 3; calcium chloride and grease, 3 parts; mixes, heats, and presses.

695,591. Heinrich Thron, Frankfort-on-Main, Germany. Assignor to Vereinigte Chinin Fabriken Zimmer and Co., same place. Anisic acid **ester of cinchona alkaloids.** Insoluble in water, soluble in alcohol, benzene, and chloroform, having basic properties and forming well characterized salts with acids, crystallize in fine, tasteless needles, melting at 87° to 88° C.

695,627. Herman Rosenberg, New York, N. Y. Assignor to Standard Varnish Works, same place. **Imitation leather.** A coat of rubber is vulcanized on a textile fabric, and on this is vulcanized a composition of oil, sulphur, benzene, turpentine and color.

695,667. Joseph Bonnet, Paris, France. **Explosives.** A picric acid derivative is dissolved in a free fatty acid, and a substance to support combustion is added such as potassium chlorate.

695,670. Francis C. Crean, Montreal, Canada. **Making iron,** and alloys thereof. Feeds iron particles to the bottom of a vessel containing molten metal and gradually changes the feeding point towards the top.

695,678-9. Both to Joseph L. Ferrell, Philadelphia, Pa. **Fireproofing compound** and a fireproof wood. Impregnates wood with an aqueous solution of aluminum sulphate, then with alkaline carbonate, or magnesium carbonate, or mixes the two solutions together.

695,702. Alfred Wohl, Charlottenburg, and Alexander Kollrepp, Berlin, Germany. **Recovering sugar.** Expresses the lye from a mixture of alkali lye and lead sucrate, adds warm wash lye to the latter, saturates it with carbon dioxide, till the sugar is entirely liberated, separates the precipitate from the sugar solution, and adds more carbon dioxide to the precipitate in acid solution.

695,720. Edward Gudemann, Chicago, Ill. **Utilizing gluten tailings.** Consists in making cornstarch by crushing the grain, floating off the husks and germs, regrinding the kernels and floating off the gluten as tailings from the detained starch, separating water from the tailings, heating them to gelatinize the starch remnant, in the presence of a preliminary malt addition, digesting the mass and adding more salt, isolating the solution to

Digitized by Google

recover maltose, leaving the gluten residue in condensed form with large content of proteids.

695,730. Frank Jones and Charles L. Pennell, Massillon, Ohio. **Core for casting pipe,** of peat, clay, straw, tar, soda ash, and lime.

695,751. George Mitchell, Westminster, London, England. **Extracting gutta percha.** Dissolves the crude material in carbon disulphide, separates the solution from leaves, twigs, etc., and distils for the gum.

695,762. Dmitry A. Peniakoff, Brussels, Belgium. **Purifying aluminous ores.** Converts iron into iron sulphide, treats the mass with sulphurous acid, washes to dissolve out iron hyposulphite and finally recovers the sulphur by converting the iron hyposulphite into an alkaline hyposulphite.

695,765. Sigmond Saxe, New York, N. Y. **Tanning process.** Tans hides first with solution of natural tan bark to which extract is first added, then commercial lactic acid in proportion to the weight of the hides.

695,778. Casimir Wurster, London, England. **Sizing paper.** Adds to the resin soap used a bisulphate of alkali and an aluminum salt as aluminum sulphate.

695,795. Alexander Classen, Aachen, Germany. Converting **cellulose into sugar.** Heats the cellulose in a closed vessel with chlorine yielding substances from 120° to 145° C., then introduces sulphur compounds to produce sulphuric acid by reaction with chlorine.

695,811. Paul Julius and Fritz Gunther, Ludwigshafen, Germany. Assignors to the Badische Anilin and Soda Fabrik, same place. **Red azo dye.** From β-naphthol and diazotized 2-amidol-1-naphthylmethane sulpho acid, dyeing wool red from acid bath; is blue violet with concentrated sulphuric acid, and may be reduced to its elements.

695,812. Paul Julius and Frederic M. Jahrmarkt, Mannheim, Germany. Assignors to Badische Anilin and Soda Fabrik, Ludwigshafen, Germany. **Chloranisidine.** A white substance melting at 83° C., whose nitric and hydrochloric acid salts are white substances decomposing on heating; it may be diazotized and combined with β-naphthol to form a red substance insoluble in water but giving a violet-red color with strong sulphuric acid.

695,835. Friedrich Reubold, Ludwigshafen, Germany. **Black sulphur dye.** Di-*p*-hydroxydiphenyltrinitro-*m*-phenylenediamine is melted with sulphur and sodium sulphide; the dye is soluble greenish in water, which becomes bluer on adding sodium sulphide and dirty green in strong sulphuric acid, dyeing unmordanted cotton a greenish shade, which turns bluer with hydrogen peroxide and ammonia.

Digitized by Google

MARCH 25, 1902.

695,927. William A. Hall, Bellows Falls, Vt. **Casein solution.** Hydrochloric acid, casein, sodium phosphate, 10 per cent., and water, 1 to 3 parts.

696,019–20. Both to Arthur Eichengrun and Karl Demeler, Elberfeld, Germany. Assignors to Farbenfabriken, of Elberfeld Co., New York. The first for the process of **developing photographs** with the compound of the second, *viz.*, **amidooxybenzyl alcohol,** forming colorless leaves decomposing in contact with the air, soluble in hot water, alcohol and ether, melting at 135° to 142° C., as hydrochloride forming white needles, and obtained by treating nitrophenols with halogenmethylic alcohol in the presence of condensing agent as zinc chloride then reacting on the product with water, alcohols, acids or their alkaline salts, and finally reducing the resultant nitrooxybenzyl alcohols, their ethers or esters.

696,105. Abiel W. Nelson, New London, Conn. **Disinfectant.** Waste wood products saturated with aluminum sulphate and coated with calcium sulphate.

696,123. Henry P. Weidig, Newark, N. J. **Surgical dressing.** A fabric having threads of exteriorly noncolloidized pyroxylin and a core of common cellulose.

696,148. Henry J. Rosevelt, Little Silver, N. J. **Putty.** Mineral clay, 90; raw linseed oil, 10 per cent.

696,156. Heinrich Wulkan, Slanje, Austria-Hungary. **Obtaining starch and zein.** Mixes comminuted corn with a solution of alcohol and alkali, separates the alcoholic liquid from the corn, distils the alcohol from said liquid, from which zein is precipitated by dilute acid.

696,222. Fritz Arledter, New York, N. Y. **Refining resins,** fats, etc. Mixes raw material with suitable alkali as sodium hydrate, treats the mixture with carbon dioxide, and separates the purified resin oil or fat.

696,244. Edward Keller, Baltimore, Md. **Making alloys.** First ascertaining by analysis if segregation occurs towards or from the portions of casting, first to solidify; second, varying the proportion of foreign soluble material as lead or zinc added to the mass in accordance with the previously ascertained direction and degree of segregation to maintain a homogeneity of the mass at the temperature of solidification; and lastly, casting the mass.

WM. H. SEAMAN.

Digitized by Google

REVIEW OF AMERICAN CHEMICAL RESEARCH.

VOL. VIII. No. 10.

WILLIAM A. NOYES, Editor.

REVIEWERS:

M. T. Bogert, E. M. Chamot, B. S. Cushman,
Benton Dales, L. M. Dennis, A. H. Gill,
H. M. Goodwin, W. F. Hillebrand, L. P. Kinnicutt,
H. W. Lawson, H. N. McCoy, A. A. Noyes,
J. W. Richards, S. P. Sadtler, J. O. Schlotterbeck,
W. H. Seaman, F. P. Underhill.

GENERAL AND PHYSICAL CHEMISTRY.

A Table of Atomic Weights of Seventy-seven Elements. By THEODORE WILLIAM RICHARDS. *Proc. Am. Acad.*, 37, 600–601.—The changes from the values adopted by the author last year (*this Rev.*, 7, 143) are all of a minor character, the most considerable being the adoption of 40.13 for calcium in place of 40.1, and of 55.88 for iron in place of 55.9. A. A. NOYES.

The Calculation of Atomic Weights. By F. W. CLARKE. *Am. Chem. J.*, 27, 321–328.—The author contends that each experimentally determined ratio (like $CaF_2 : CaSO_4$) should not be used in calculating the atomic weight of only a single element (like fluorine), as is usually the case, but should, whenever possible, be combined with other ratios, and thus contribute to a knowledge of the atomic weight of all the elements involved, and thus distribute the experimental error upon them all, instead of causing it to fall on a single atomic weight. When more ratios have been determined than the number of atomic weights involved in all of them, a series of normal equations can be derived by the method of least squares, and the most probable atomic weight of each element obtained by the solution of these equations. The author illustrates this by calculating from 30 ratios the atomic weights of seven elements (Ag, Cl, Br, I, N, Na, K). The chief difficulty lies in the assignment of proper weights to the separate experimental ratios. A. A. NOYES.

A Redetermination of the Atomic Weight of Lanthanum. By HARRY C. JONES. *Am. Chem. J.*, 28, 23–34.—Lanthanum oxide was obtained by fractional crystallization of a large quantity of unusually pure ammonium lanthanum nitrate, ignition, re-solution of the oxide in dilute nitric acid, precipitation from the acid solution with oxalic acid, ignition of the oxalate, re-solution in nitric acid, reprecipitation with oxalic acid, and final ignition.

Digitized by Google

It was tested spectroscopically, and found to contain no impurity except a trace of cerium estimated at less than 0.01 per cent. Hydrogen at a red heat had no effect upon it, proving the absence of higher oxides. This oxide was weighed and converted into the sulphate by evaporation with strong sulphuric acid and heating to a constant weight. The resulting sulphate dissolved completely in water with a perfectly neutral reaction. Twelve such determinations of the ratio $La_2O_3 : La_2(SO_4)_3$ gave very closely agreeing results, the mean value for the atomic weight being 138.77. The values adopted by Richards and Clarke in their last reports are 138.5 and 138.6, respectively. A. A. NOYES.

The Preparation of Cells for the Measurement of High Osmotic Pressures. BY H. N. MORSE AND J. C. W. FRAZER. *Am. Chem. J.*, **28**, 1–23.—The article describes the mechanical contrivance which has been employed in connecting the ferrocyanide membranes prepared electrolytically (see *this Rev.*, **7**, 160) with a manometer so as to withstand high pressures. The very considerable difficulties met with arose almost wholly from leakage and bursting of the apparatus, and not from imperfections in the membrane. An apparatus with a cell of over 200,000 ohms' resistance was finally constructed, which, when charged with a molar cane-sugar solution, developed in one and three-quarter hours, a pressure of 31.4 atmospheres at 25°, after which time the glass tube connecting the porous cup with the manometer was shattered. The conditions for producing as perfect a membrane as this have, however, not been determined. Rough measurements of $^1/_2$ molar and molar cane-sugar solutions show that at 20°–25° the osmotic pressure of the former is about 13.5 atmospheres and that that of the latter is greater than 31.4 atmospheres, thus considerably in excess of the values required by Boyle's Law, which are about 12 and 24 atmospheres, respectively. A. A. NOYES.

The Lowering of the Freezing-Point of Water Produced by Concentrated Solutions of Certain Electrolytes and the Conductivity of Such Solutions. BY HARRY C. JONES AND FREDERICK H. GETMAN. *Am. Chem. J.*, **27**, 433–444.—In continuation of previous investigations (*this Rev.*, **6**, 72, 141), the authors have determined the freezing-point lowering and electrical conductivity at 0°, up to two- or threefold molar concentration, of solutions of nitric, hydrochloric, and sulphuric acids, of potassium hydroxide, of calcium, strontium, and barium chlorides, and of sodium and potassium nitrates. The molecular lowering of all these substances except the last two has a minimum value at some concentration below 0.5 molar. The molecular conductivity of all of them decreases continuously with increasing concentration. A. A. NOYES.

Digitized by Google

On the Depression of the Freezing-Point in Aqueous Solutions of Electrolytes. By J. G. MacGregor. *Trans. Royal Soc. Canada*, **6**, Sec. III, 3–19.—The article consists of calculations, based on previously published experiments, by which it is shown that the molar freezing-point depression is a function of the form $k(l - \alpha) + l\alpha$, in which α is the fractional dissociation and k and l are empirical constants which do not differ greatly in value from the theoretical ones (1.86, 3.72, etc.).

A. A. Noyes.

On the Depression of the Freezing-Point in Solutions Containing Hydrochloric and Sulphuric Acids. By James Barnes. *Trans. Royal Soc. Canada*, **6**, Sec. III, 37–54.—Experiments are communicated on the conductivities at 0° of the two acids between 0.001 and 0.3 molar concentration, from which their degrees of dissociation are calculated; also on the freezing-points of their solutions between 0.02 and 0.3 molar, and of solutions of twelve different mixtures of the two acids. It is shown that the freezing-points of these mixtures can be calculated from the empirical molecular freezing-point lowerings and degrees of dissociation of the components so as to agree with the observed values within 0.002°, under the assumption that sulphuric acid dissociates only into $H^{\bullet}$, $H^{\bullet}$, and SO_4''. A. A. Noyes.

On the Relative Bulk of Weak Aqueous Solutions of Certain Sulphates and their Constituent Water. By Charles M. Pasea. *Trans. Royal Soc. Canada*, **6**, Sec. III, 27–36.—Density determinations were made at 18° of 0.005 to 0.06 molar solutions of the sulphates of sodium, manganese, cadmium and ferrous iron. In the last two cases, below 0.01–0.03 molar, the volume of the solution is less (*in maximo* by about 0.01 per cent.) than that of the pure water it contains. A consideration of previously published experiments shows that the same is true of most other bivalent metal sulphates. Sodium sulphate and other alkali metal sulphates show no such contraction of their solutions, however. With manganese sulphate the contraction is hardly observable. A. A. Noyes.

The Inactivity of Lipase Towards the Salts of Certain Acid Ethers Considered in the Light of the Theory of Electrolytic Dissociation. By J. H. Kastle. *Am. Chem. J.*, **27**, 481–486.—Lipase, the hepatic enzyme, has been found to hydrolyze a large number of esters both of monobasic and dibasic acids, but to be entirely inactive towards potassium or sodium salts of acid esters (like sodium ethyl succinate), though it is not thereby itself poisoned or rendered inert towards neutral esters. Since, furthermore, certain amides of such acid esters (thus, ethyl oxamate) are hydrolyzed, the author considers it probable that it

Digitized by Google

is the electrolytic dissociation of the salts that accounts for the failure of the enzyme to act upon them. A. A. NOYES.

Note on the Application of the Phase Rule to the Fusing-Points of Copper, Silver and Gold. BY THEODORE WILLIAM RICHARDS. *Am. J. Sci.*, (4), 13, 377–378.—The fact that Holborn and Day (*this Rev.*, 7, 190) found that copper when heated in air has a constant melting-point 19° lower than that shown when it is heated in complete absence of oxygen is explained by the Phase Rule, if it be assumed that the copper becomes saturated with cuprous oxide and that this then separates in the liquid state as a new phase, thus producing the conditions for a fixed point. Silver shows a variable melting-point in air, because no such additional phase results and because the amount of oxygen dissolved in it varies greatly with the temperature and attains equilibrium with the gas only slowly. Gold has the same melting-point in air and out of it, since it does not dissolve oxygen or nitrogen appreciably. A. A. NOYES.

Analytical Chemistry and the Phase Rule Classification. BY WILDER D. BANCROFT. *J. Phys. Chem.*, 6, 106–117.—This paper is a very general discussion of the relations of physical chemistry to analytical chemistry. The Phase Rule is considered to be all important; but the far more useful Law of Mass Action is not referred to. A. A. NOYES.

The Nomenclature of Variance. BY J. E. TREVOR. *J. Phys. Chem.*, 6, 136–137.—The author suggests the replacement of the hybrid terms mono, di, and polyvariant by the pure Latin compounds, uni, bi, and multivariant. The same suggestion was made some years ago by Richards (*Am. J. Sci.*, (4) 6, 201 (1898)). The author also suggests the use of invariant in place of the more awkward term non-variant. A. A. NOYES.

Synthetic Analysis of Solid Phases. BY WILDER D. BANCROFT. *J. Phys. Chem.*, 6, 178–184.—It is suggested that in order to avoid the difficulty arising from adhering mother-liquor, the composition of a solid phase which separates from a solution and which may consist of two components, might be determined by adding a third component and analyzing the solution with reference to it before and after the separation of the solid phase: or that it might be done by bringing the solution and solid phase into equilibrium at the desired temperature, analyzing the solution, and then adding the two components in varying proportions until the proportions are such that the composition of the solution does not show a change after the equilibrium is restored; the solid phase must then contain the two components in the added proportions. A. A. NOYES.

Digitized by Google

Varying Degrees of Activism of the X-Rays. By JOHN O. HEINZE, JR. *Am. J. Sci.*, (4), 13, 313–314.—Of a series of X-rays produced by varying the current strength in the secondary coil those which caused the most brilliant fluorescence on a screen were found to have the slightest effect on a photographic plate.

A. A. NOYES.

The Significance of Changing Atomic Volume. II. The Probable Source of the Heat of Chemical Combination, and A New Atomic Hypothesis. III. The Relation of Changing Heat Capacity to Change of Free Energy, Heat of Reaction, Change of Volume, and Chemical Affinity. By THEODORE WILLIAM RICHARDS. *Proc. Am. Acad.*, 37, 399–411; 38, 79; *Ztschr. phys. Chem.*, 40, 597–610.—II. It is shown that there is a close parallelism between the heat effects and the decreases in volume that attend the formation from the elements of metallic chlorides, metallic bromides, and the potassium halides. By further taking into account the different degrees of compressibility of the metals combining with a definite halogen the approximation becomes closer. An estimate of the work necessary to compress an atomic weight each of sodium and chlorine into the space occupied by one mol of the salt shows that it is probably of the same order of magnitude as the observed heat of formation. These results lead to the inference that the heat of chemical reactions is mainly due to the work done by internal forces in compressing the material, and the author considers that his hypothesis of compressible atoms (see *this Rev.*, 7, 159) furnishes a more satisfactory explanation of them than the usual assumption of rigid atoms.

III. In the case of almost all the voltaic cells in which no considerable concentration differences exist and for which sufficiently accurate data are available, the author finds that the difference between the heat effect of the chemical reaction, and the electrical energy that can be produced by it, is positive when the heat-capacity of the system diminishes as a result of the reaction, and negative when the heat capacity increases. It is estimated, however, that the change in heat capacity is not nearly of sufficient magnitude to account for the difference between the two energies, and this leads the author to conclude that the electrical energy producible (or the free-energy change) is probably less than the sum of the energies due to chemical affinity and other forms of attraction. This result is interpreted with the help of the hypothesis of compressible atoms. The effect of considerable concentration differences and of the corresponding osmotic work is also considered. A parallelism is shown to exist between the electromotive force of single metals in their own salt solutions, their heats of ionization, and the heats of formation of their hydroxides. The bearing of the considerations on the validity

Digitized by Google

of Guldberg and Waage's Law, and on Berthelot's Principle of Maximum Work is discussed. A. A. NOYES.

On the Accuracy of the Improved Voltameter. BY THEODORE WILLIAM RICHARDS AND GEORGE WILLIAM HEIMROD. *Proc. Am. Acad.*, 37, 415–443; *Ztschr. phys. Chem.*, 41, 302–330.—It had been previously shown (*this Rev.*, 6, 76) that the slight variations in the quantity of silver deposited in the ordinary voltameter can be prevented by placing the silver anode within a porous cup and keeping the level of the silver nitrate solution in it below that of the solution in the crucible outside. Further experiments proving the constancy of the porous cup voltameter are now communicated together with others which show that identical results are obtained when other methods of preventing diffusion from the anodic silver nitrate solution to the cathode are employed; thus, in two experiments, a zinc anode and a zinc nitrate solution were placed within the porous cup, and in two other experiments, a silver plate anode was placed at the bottom of a beaker and a platinum wire gauze cathode was suspended in the silver nitrate solution above, no porous cup being used.

The cause of the disturbance which the anode solution produces in the ordinary voltameter was also investigated. It was shown that saturating the cathode solution with either silver nitrite or silver oxide increases the deposit by a few hundredths of a per cent.; that slight acidification removes this influence in the case of the silver oxide; that a deposit larger by 0.1 per cent. is produced upon silver than upon platinum with the usual paper-wrapped anode, but not with an anode in a porous cup, and that the anode solution after electrolysis in the porous cup; deposits a little silver when allowed to stand in a silver-coated platinum crucible. These last facts, and also the separation from the anode solution of the crystalline dust consisting of pure silver, are explained by the assumption that some silver passes into solution at the anode in the form of a readily decomposable polymerized silver ion, such as Ag_3.

The purity of the silver deposit was found in accordance with Lord Rayleigh's results to be scarcely affected by the presence of even enough copper to give a green color to the solution. The deposit dried at 160° lost, on an average, 0.018 per cent. of its weight upon subsequent ignition, and that furnished by the porous cup method was found to be 0.05 per cent. lighter than that obtained in the ordinary voltameter as used by Lord Rayleigh.

By applying these and other suitable corrections to the previous determinations of the electrochemical equivalent of silver, this is found to be 0.0011175 milligram per coulomb. The electrochemical constant is, therefore, 96,580 coulombs per gram-equivalent. Correction of the previous ratio of the silver and copper

Digitized by Google

deposited by the same quantity of electricity leads to 63.601 for the electrochemically determined atomic weight of copper, in complete agreement with that chemically determined (63.604).

Incidentally, the excellent suggestion is made that the inappropriate name voltameter be replaced by the word coulometer.

A. A. NOYES.

The Specific Heat of Solutions. III. A Form of the Pfaundler Calorimeter. BY WILLIAM FRANCIS MAGIE. *Phys. Rev.*, 14, 193–203.—The article describes in great detail the construction, method of operating, corrections, and constants of a calorimeter of the Pfaundler type in which the solution and the pure solvent are heated in entirely similar silver vessels by insulated coils of equal resistance through which the same current is passed, and the rise of temperature in each liquid is noted. Some results with a $^1/_{200}$ molar milk-sugar solution are communicated.

A. A. NOYES.

On the Specific Heat of Supercooled Water. BY H. T. BARNES AND H. LESTER COOKE. *Phys. Rev.*, 15, 65–72.—Two equal quantities of water, one of which had been previously supercooled to between —3.3 and —5.6° and the other heated to an exactly measured temperature near 40°, were mixed in an empty calorimeter, and the resulting temperature was observed. From these experiments values of the specific heat-capacity at temperatures below zero were calculated and found to correspond with those extrapolated from the curve of its variation between 0° and 100°. The values adopted for —5° and 0° are, in terms of the 16° unit, 1.0158 and 1.0094, respectively. A. A. NOYES.

On the Specific Heats and Heat of Vaporization of the Paraffine and Methylene Hydrocarbons. BY CHARLES F. MABERY AND ALBERT H. GOLDSTEIN. *Am. Chem. J.*, 28, 66–78; *Proc. Am. Acad.*, 37, 539–549.—Specific heat-capacity determinations of all the normal C_nH_{2n+2} (liquid) hydrocarbons from C_7H_{14} up to $C_{16}H_{34}$, which had been separated from Pennsylvania petroleum, showed a perfectly regular decrease with rising molecular weight from 0.5074 to 0.4957. Isoheptane and isodecane gave the values 0.501 and 0.495, while the corresponding normal paraffines gave 0.507 and 0.502, respectively. The series of methylene hydrocarbons obtained from California petroleum gave considerably lower results, varying from 0.488 for C_7H_{14} to 0.453 for $C_{14}H_{28}$. A few hydrocarbons of the C_nH_{2n-2} series, separated from Texas petroleum, gave still lower values; thus, 0.445 was found for $C_{14}H_{26}$. In the case of the normal paraffines it is shown that the molar heat-capacity divided by the number of atoms in the molecule is somewhat more constant than the specific heat-capacity itself.

Digitized by Google

The heats of vaporization of hexane, heptane, and octane, of hexamethylene and its methyl and dimethyl homologues, and of dimethylpentamethylene were also determined. In both series there is a rapid decrease with increasing molecular weight.

A. A. NOYES.

I. Surface-Tension at the Interface of Two Liquids Determined Experimentally by the Method of Ripple Waves. II. Viscosity of Liquids Determined by Measurement of Capillary Waves. BY FLOYD R. WATSON. *Phys. Rev.*, 12, 257–278; 15, 20–38.—For a description of the apparatus and methods employed and theory involved, reference must be made to the original articles. In the first of these are presented values of the surface-tension (reduced to 0°) for water, mercury, petroleum, benzine, and also of the surface-tension between water and mercury, alcohol and mercury, water and benzine, and water and petroleum. Some of the results were checked by other methods. In the second article are given values of the surface-tension and surface-viscosity for water, mercury, and eight organic liquids. The surface viscosity has substantially the same value as the internal viscosity determined by other methods. A. A. NOYES.

On Spectra Arising from the Dissociation of Water Vapor and the Presence of Dark Lines in these Spectra. BY JOHN TROWBRIDGE. *Am. J. Sci.*, (4), 14, 1–6.—When very powerful discharges take place in a Geissler tube containing carefully dried hydrogen at 0.1 mm. pressure, there results a continuous spectrum on which are superposed not only the bright lines of the water-vapor spectrum (*this Rev.*, 7, 190), but also certain dark lines which are attributed to a failure of photographic plates to respond to the corresponding light vibrations.

A. A. NOYES.

The Wave Number System for Rhodium. BY C. P. SNYDER. *Astrophys. J.*, 14, 179–180. **Spectroscopic Studies.** BY EDUARD HASCHEK. *Ibid.*, 14, 181–201. **Some New Peculiarities in the Structure of the Cyanogen Bands.** BY A. S. KING. *Ibid.*, 14, 323–330.

Thermostats and Thermoregulators. BY WILLIAM C. GEER. *J. Phys. Chem.*, 6, 85–105.—The author classifies and discusses the principles of the various forms of thermostats and regulators which have been previously employed, publishes an extensive bibliography relating to them, and describes an electrically heated and regulated thermostat of his own. The current from a 110-volt alternating circuit passes through a German silver heating coil within the thermostat, through an external wire resistance to reduce the current-strength, and through either a resistance of a series of lamps or a platinum point contact on a relay which is

Digitized by Google

opened and closed by a secondary storage cell current that is made and broken by means of a mercury expansion regulator, having a lamp in parallel with it to avoid sparking at the contact.

A. A. NOYES.

A Thermostat Sensitive to a Thousandth of a Degree. BY W. P. BRADLEY AND A. W. BROWNE. *J. Phys. Chem.*, 6, 118–135.—The thermostat consists of a glass bell-jar containing water stirred by a propeller and regulated in temperature by the inflow of warm water from a second metal thermostat heated by gas and roughly regulated by a small alcohol expansion regulator with a mercury cut-off of the type described by Ostwald (*Ztschr. phys. Chem.*, 2, 565). The inflow of warm water is also controlled by an entirely similar regulator. The body of these regulators consists of a long spiral tube only 5 mm. in diameter, so as to ensure a rapid response to temperature changes. The article deserves especial attention because it presents a systematic discussion and experimental study of the conditions for attaining the greatest constancy of temperature. A. A. NOYES.

A New Gauge for the Measurement of Small Pressures. BY BY EDWARD W. MORLEY. *Am. J. Sci.* (4), 13, 455–458.—Two forms of siphon gauges are described and illustrated by a figure. These are based on the principle of measuring the tilting of the apparatus needed to bring the mercury levels in contact with platinum points. By means of them, small pressures can, under the best conditions, be measured with a mean error of about 0.0001 mm. A. A. NOYES.

The Metric System of Weights and Measures. BY THE COMMITTEE ON COINAGE, WEIGHTS AND MEASURES OF THE HOUSE OF REPRESENTATIVES. *Science*, 15, 829–836.—This report presents in a clear and convincing manner the advantages of the general adoption of the metric system, both from the points of view of scientific, educational, manufacturing, commercial, and ordinary business interests. It emphasizes the fact, that whether or not the most perfect system imaginable, it is the only one that has the slightest chance of universal international adoption, which is a matter of fundamental importance. A. A. NOYES.

The Periodic System and the Properties of Inorganic Compounds. IV. The Solubility of Double Sulphates of the Formula $M^{I}_{2}M^{II}(SO_4)_2.6H_2O$. BY JAMES LOCKE. *Am. Chem. J.*, 27, 455–481.—The solubilities at 25° determined for thirty salts of the type shown in the title, expressed in mols per liter are given in the following table, where they are arranged both vertically and horizontally in the general order of increasing values:

Digitized by Google

	Ni.	Zn.	Co.	Cu.	Mg.	Fe.	Mn.	Cd.
Tl.....	0.070	0.129	....	0.122	....	....	....	....
Rb.....	0.142	0.236	0.220	0.241	0.521	0.579	0.857	1.615
K.....	0.209	0.393	0.391	0.350	....	....	....	....
NH_4.....	0.264	0.480	0.513	....	0.791	1.044	1.321	2.125
Cs.....	0.495	0.738	0.810	0.882	1.106	1.967	1.570	2.455

The order of the solubilities of the salts of the five univalent metals is the same, whatever be the bivalent metal. This is also true, with three or four not very pronounced exceptions, of the solubilities of the salts of the eight bivalent metals, whatever be the univalent metal considered. The same regularity is shown by the solubility of the alums (see *this Rev.*, 7, 145). The general principle involved, of which a mathematical development is presented, is expressed by the author as follows: In a group of isomorphous (double) compounds, the effect of a given element upon the solubility of its compounds is constant. In other words, in such a group the solubility is a function of the nature of the separate component salts, but not of any relation between them. It would be of interest in this connection to compare the solubilities of difficultly soluble simple isomorphous salts as to their additivity with reference to their ions.

The author especially emphasizes the fact that the sequence of the solubilities even of the salts of elements of the same group of the periodic system does not correspond to the sequence of atomic weights. Thus the former sequences are Rb, K, Cs; Zn, Mg, Cd; and Ni, Co, Fe. A. A. NOYES.

Electro-Affinity as a Basis for the Systematization of Inorganic Compounds. BY R. ABEGG AND G. BODLÄNDER. *Am. Chem. J.*, 28, 220–228.—In reply to Locke's criticism (*this Rev.*, 8, 266) of their theoretical conceptions, according to which readily dischargeable ions (those of small "electro-affinity") tend to form salts which have only a small solubility-product with respect to those ions, and also tend to form complex ions, the authors disclaim any intention of maintaining that electro-affinity is the sole factor that determines solubilities. In the first place, one must take into account the effects of slight dissociation, of the formation of hydrated and complex ions, and, in case of double salts, of the presence of common ions, which all influence the total solubility of the salt, but not the solubility-product of the simple ions. Moreover, it is recognized by the authors that this product is dependent on the character of the solid substance as well as on the electro-affinity of the ions. In this connection the reviewer would suggest that by confining the comparison of solubilities to groups of isomorphous compounds this factor, which must be one of fundamental importance, would be to a great extent eliminated. It is also conceded that in the formation of complex ions, atomic affinities come into play as well as electro-affinities, and it is

Digitized by Google

pointed out that in the production of metal ammonia compounds the solubility of the metallic hydroxide is an important factor. In view of these and other possible explanations of apparent deviations from their theory, the authors maintain that the latter may still contain a fundamental truth, and is worthy of more extended investigation. A. A. NOYES.

On the Mixed Crystals of Silver Chlorate and Sodium Chlorate and Their Solutions. BY H. W. FOOTE. *Am. Chem. J.*, **27**, 345–354.—Sodium and silver chlorates are known to form two series of mixed crystals. The author has determined the composition of the two kinds and the concentration of the solution in each salt, when both forms of crystals separate together at 12°, 25°, 35°, and 50°. The composition of the crystals varies with the temperature as with the salts previously investigated (*this Rev.*, **8**, 2). Similar experiments with solution from which only one form of crystals separate show that the molar ratio of sodium to silver chlorate in the solution is always greater than the same ratio in the mixed crystals, but that these two ratios become more nearly equal as the temperature increases. It is not made apparent that the results have any general significance. A. A. NOYES.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

Report by Robert T. Hill on the Volcanic Disturbances in the West Indies. *National Geog. Mag.*, **13**, 223–267.—In this lengthy report all the facts and evidence collected by the writer are marshaled. No convictions are expressed as to the cause of conflagration and death in St. Pierre, but the alternative theories of heat-blast and aerial explosion of some combustible gas issuing from a lateral crater, are offered. W. F. HILLEBRAND.

The Recent Volcanic Eruptions in the West Indies. BY ISRAEL C. RUSSELL. *National Geog. Mag.*, **13**, 267–285.—The writer favors the view that the majority of fatalities at St. Pierre and on St. Vincent were due to a blast of steam charged with hot dust. At St. Pierre gases, probably in part inflammable, were no doubt present, but played only a secondary part.
W. F. HILLEBRAND.

Volcanic Rocks of Martinique and St. Vincent. Collected by ROBERT T. HILL AND ISRAEL C. RUSSELL. Described by J. S. DILLER. *National Geog. Mag.*, **13**, 285–296.—The rocks of Martinique and St. Vincent, both ancient and modern, belong to well marked types of andesite, hypersthene being the prevailing ferro-magnesian silicate, commonly associated with some augite. In some specimens, hornblende appears, and in a few it is sufficiently abundant to characterize the rock as hornblende andesite.

Digitized by Google

The product of the recent outbursts is hypersthene andesite. Several of the St. Vincent rocks are abnormal in that they contain olivine. Six complete analyses are given, five by chemists of the U. S. Geological Survey, the other by Dr. Pollard, reproduced from *Nature* of June 5th, also one of hypersthene andesite from Crater Lake, Oregon, for comparison, because of its great similarity in composition. W. F. HILLEBRAND.

Chemical Discussion of Analyses of Volcanic Ejecta from Martinique and St. Vincent. BY W. F. HILLEBRAND. *National Geog. Mag.*, 13, 296–299.—The analyses in the foregoing paper by Dr. Diller and three others less complete—all that have thus far appeared in print—are critically discussed and certain inferences drawn from their comparison. If the assumptions of a probable inaccuracy in the determination of soda in an analysis of dust from the Barbados (*Chem. News*, June 13th) and of a confusion of labels in that purporting to represent dust from the S. S. Roddam (*Chem. News*, June 13th) are justified, and of this there seems little doubt, chemical analysis is able to distinguish readily between the ejecta from the two volcanoes. The distinctions are: "Higher silica and potash with, in general, lower alumina, total iron, lime, magnesia, and titanium in the ejecta from Pelée. The difference in titanium seems to be particularly marked and characteristic. There are, however, other differences, of which the most striking is the almost complete absence of sulphur in the Pelée ejecta, while in those from the Soufrière it is a very marked constituent, both in the sulphate and sulphide conditions." Chemical tests show that the sulphide is not pyrite, but in all probability, pyrrhotite. The importance in future analyses of differentiating the sulphate and sulphide sulphur is pointed out. The presence of nickel and cobalt to the amount of 0.07 per cent., as reported by Dr. Pollard in *Nature*, is questioned on the strength of analyses made in the Geological Survey, but the observation of Dr. Porter, in the same journal, that copper in traces is apparently a constituent of the dust from the Barbados, is believed to be correct, though devoid of significance, for the experience of the chemists of the Geological Survey points to its general distribution through all rocks.

W. F. HILLEBRAND.

Peculiar Character of the Eruption of Mt. Pelee, May 8th. BY A. E. VERRILL. *Am. J. Sci.*, 14, 72–74.—The writer further discusses, in the light of later information, the theory first suggested by himself, that the destruction of St. Pierre and its inhabitants was due chiefly to exploding oxygen and hydrogen gases, these being expelled through openings in the perpendicular wall of an oblique lateral crater in a nearly horizontal direction directly toward the city. The gases are supposed to have origi-

Digitized by Google

nated through contact of highly heated lava with bodies of water or porous rocks saturated with water. "Eruptions of this kind might well be designated as the *oxy-hydrogen explosive type*, the principal destruction being caused by the explosion of vast volumes of these gases, while in the much more common type of eruptions the explosions are caused mainly by the escape of steam under very high pressures." W. F. HILLEBRAND.

Field Notes of a Geologist in Martinique and St. Vincent. BY THOS. AUG. JAGGAR. *Pop. Sci. Monthly*, 61, 352–368.—In discussing what actually happened in the eruptions and what caused death, the author discloses views which differ radically from those reported in the foregoing abstract. The destruction of St. Pierre is ascribed to an eruption from the summit crater of Pelée. The horizontal blasts that swept the city on the 8th and 20th May, "do not require a horizontal nozzle to project them. They are simply the result of the down-blast after the heavy gravel has begun to fall, acting against the upblast from the throat of the volcano, and both together deflected and thrown into terrific whirls or tornadoes by the prevailing wind. . . . The death-dealing billows of falling hot sand and gravel, *themselves a mighty downward wind*, deflecting with them the rising hot steam and gases, finally rush down the mountain slope in whatever directions they are guided by vale and ridge and wind. They were guided into the cliff-hollow of St. Pierre at Martinique, and Walliabou at St. Vincent, both to leeward of the craters." The author does not deem it necessary to invoke the aid of burning gases in order to account for the destruction and death. ". . no doubt there were several gases present and the combustion of tropical vegetation made others that were highly explosive if mixed with air . . . The people of St. Pierre were killed by steam, hot dust, falling stones, falling buildings, drowning, burial alive and burning." The absence on both islands of recent outpourings of lava is noted. W. F. HILLEBRAND.

Occurrence of Greenockite on Calcite from Joplin, Missouri. BY H. B. CORNWALL. *Am. J. Sci.*, 14, 7–8.
W. F. HILLEBRAND.

Petrography of Recently Discovered Dikes in Syracuse, N. Y., with Note on the Presence of Melilite in the Green St. Dike. BY C. H. SMYTH, JR. *Am. J. Sci.*, 14, 26–30.
W. F. HILLEBRAND.

Preliminary Note on Silver Chabazite and Silver Analcite. BY GEORGE STEIGER. *Am. J. Sci.*, 14, 31–32.—As an outgrowth of the work of Clarke and Steiger in replacing the alkali of certain silicates by ammonium, Steiger has now succeeded in

Digitized by Google

replacing the alkali of chabazite and analcite almost wholly by silver, and will extend his experiments to other minerals, endeavoring also to introduce thallium, lead, and other metals. Ammonium chabazite was heated in a sealed tube for four hours at 250° C. with silver nitrate, and also in an open dish for several hours with a 10 per cent. solution of the nitrate. In the former case the washed and dried residue yielded 25.06 per cent. Ag_2O, and in the latter, 17.20 per cent. Natural analcite, when heated in sealed tubes with dry nitrate, yielded products holding 37.45 and 36.91 per cent. of Ag_2O and only 0.85 and 0.81 per cent. of Na_2O. Ammonium analcite when similarly treated gave a product yielding 32.01 per cent. Ag_2O, 0.68 per cent. Na_2O, and 0.69 per cent. NH_3. W. F. HILLEBRAND.

The Action of Copper Sulphate upon Iron Meteorites. By O. C. FARRINGTON. *Am. J. Sci.*, **14**, 38–42.—The author finds from his study nothing to support the belief of Wöhler that certain meteorites are inherently passive, but on the contrary that meteorites act like any other iron-nickel alloy. "Incidentally . . . the experiments indicated that immersion of an iron nickel alloy in a solution of copper sulphate will afford a rough test of the percentage of nickel contained in the alloy, and, since a meteorite must contain nickel, a quick means of distinguishing meteoric from terrestrial iron." The influence of temperature was, however, found to be very apparent in changing the time required for incipient visible deposition of copper. Raising the temperature hastened, lowering it retarded, deposition. Other observations are recorded, relating to the conditions that may affect the activity of meteorites. W. F. HILLEBRAND.

A Petrographical Contribution to the Geology of the Eastern Townships of the Province of Quebec. By JOHN A. DRESSER. *Am. J. Sci.*, **14**, 43–48.

Nepheline and Other Syenites Near Port Coldwell, Ontario. By A. P. COLEMAN. *Am. J. Sci.*, **14**, 147–155.—Four fairly well-marked types of nepheline-syenites, with, however, many intermediate varieties, are described, also two well-marked varieties of augite-syenites, and three kinds of plagioclase rocks, most of which are supposed to represent phases of differentiation of the same magma. An analysis of one of the augite-syenites, by A. H. A. Robinson, of Toronto University, gave: SiO_2, 58.81; Al_2O_3, 13.37; Fe_2O_3, 3.88; FeO, 6.97; MnO, 0.20; MgO, 0.51; CaO, 3.89; Na_2O, 4.96; K_2O, 5.42; H_2O-, 0.29; H_2O+, 0.75; TiO_2, 0.75; P_2O_5, 0.31. Total, 100.06. Sp. gr., at 17.5° C., 2.75. W. F. HILLEBRAND.

Hussakite, a New Mineral, and Its Relation to Xenotime. By H. KRAUS AND J. REITINGER. *Am. Geol.*, **30**, 46–55.—In

Digitized by Google

searching for sources of erbium and gadolinium, the supposed xenotime of Minas Geraes, Brazil, reported in 1886 by Gorceix to contain a good deal of erbium, was examined. In all cases it was found to be a sulphato-phosphate and not simply a phosphate.

	I.	II.	Mean.
SO_3	6.13	....	6.13
P_2O_5	33.50	33.52	33.51
R_2O_3	60.20	60.28	60.24
Fe_2O_3	....	0.20	0.20
			100.08

The value for R_2O_3 represents Y_2O_3, 43.43; Er_2O_3, 14.82; Gd_2O_3, 1.99. The empirical formula is $3P_2O_5.SO_3.3R_2O_3$, which may be translated into a symmetrical graphic formula, if two atoms of phosphorus are assumed to be constituents of pyrophosphoric acid and four of orthophosphoric acid.

The physical constants were carefully determined and are in part as follows: Luster vitreous, though rounded crystals have a greasy or pearly luster. Color yellowish white, honey-yellow, brown, or dark brown. H.5. Sp. gr., 4.587 at 20° C. Cleavage perfect parallel to *m* (110). Fracture uneven. Streak white to yellowish white. Crystal form and angles identical with those of xenotime. In thin section, perpendicular to the *c* axis, in convergent polarized light, a normal uniaxial interference figure is shown. Double refraction positive.

The identity of crystal form with that of xenotime suggested an examination of the latter for sulphuric acid, and in several instances, where the crystals were not wholly opaque, this was found. The conclusion is that hussakite is the parent mineral of xenotime, and that those xenotime crystals which are opaque and free from sulphuric acid are pseudomorphs after transparent hussakite. The sulphuric acid of the latter was shown by the authors to be easily removable by alkaline solutions, which fact offers an acceptable explanation of the transformation in nature. "Dr. Rösler has shown that hussakite occurs quite frequently as an accessory constituent of granites and quartz porphyries, as also of kaolinites resulting therefrom." He also observed crystals with distinct pleochroism. W. F. HILLEBRAND.

A New Meteorite from Kansas. BY OLIVER C. FARRINGTON. *Science*, **16**, 67–68.—A preliminary description of a stone which was seen to fall December 15, 1898, in Saline Township, Sheridan County, but whose exact location was not at that time established. The stone weighs 68 pounds, 10 ounces, and its specific gravity is 3.62. The chief mineral constituents are chrysolite, bronzite, and nickel iron. The chondritic structure is apparent to the naked eye. W. F. HILLEBRAND.

The Newcastle Oil Field. BY W. C. KNIGHT AND E. E. SLOSSON. *The School of Mines, University of Wyoming. Petro-*

Digitized by Google

leum Series. Bulletin No. 5, 24 pp.—This, as yet, undeveloped region at the southwestern base of the Black Hills, in Weston County, yields small amounts of lubricating oil of an excellent quality even in its crude state. "It has a high gravity, a low cold test, high viscosity and shows no paraffin or asphalt in its natural state." If reduced by slight distillation under diminished pressure and with the aid of superheated steam it yields a good cylinder oil. The residue from long distillation is mainly paraffin, wherein it differs from some other Wyoming oils.

W. F. HILLEBRAND.

Coal, Lignite and Asphalt Rocks. *The University of Texas Mineral Survey, Bulletin No. 3*, 137 pp.—Chapters I–IV were presumably prepared by the Director of the Survey, Prof. Wm. B. Phillips, with the aid of data gathered by himself and assistants. The need of a careful study of the coal resources of the State of Texas is forced by the growing competition of liquid fuel. Samples were collected at all localities where work was in progress in November, 1901, the seams were measured, and other data gathered. Of lignites, 15 analyses, and of bituminous coals 17 were made. In each case, the ash was subjected to an unusually thorough analysis. The coal analyses comprise proximate and ultimate determinations, the results of which are stated both for the natural and dry state of the coal. The heat value is also given for both states in B. T. U. and Cals. The specific gravity dry and weight per cubic foot are likewise shown.

Descriptions and analyses of the asphaltic rocks are given, and the total bitumen is separated into petrolene and asphaltene.

Chapter V is *A Contribution to the Chemistry of Some of the Asphalt Rocks Found in Texas*, by Henry Winston Harper, from which the following data are taken. The asphalt rocks contain practically no moisture, and only from 0.07 to 0.43 per cent. of matter that volatilizes at 100° C. in four hours. In seven hours, at 200° C., the loss is from 0.80 to 5.0 per cent. Some appear to lose oxygen when long heated at 100° C. In the samples examined, the total bitumen ranges from 0.65 to 27.26 per cent., the petrolene from 0.65 to 24.14 per cent., and the asphaltene from a trace to 17.24 per cent. Only one sample showed organic matter not bitumen. "The properties exhibited by these asphalt rocks do not support Tillson's contention relative to the limits of proportion of petrolene to asphaltene in total bitumen intended for paving purposes, but they do support Peckham's view." Experimental evidence strongly points to the absence of oxygen in the bitumens. "The ultimate analyses, the nitrogen and sulphur content, the action of fuming nitric acid, sulphuric acid, bromine absorption and hydrobromic acid produced, all strongly support the view of Richardson relative to the nature and origin of asphalt." "A complete investigation of the asphaltic petro-

Digitized by Google

leums of Texas will throw additional light upon the vexatious problem of the constitution of asphalt."

W. F. HILLEBRAND.

The Mining Industry [New Jersey]. By HENRY B. KÜMMEL. *Ann. Rep. State Geologist of New Jersey for 1901*, pp. 133–161. —This report contains an analysis of iron ore from the Hude mines and an account of "Copper Leaching at the American Copper Mine," by Josiah Bond. W. F. HILLEBRAND.

On the Nepheline Rocks of Ice River, British Columbia. By ALFRED ERNEST BARLOW. *Ottawa Naturalist*, 16, 70–76.—The area covered by these rocks is, so far as known, about 32 square miles. The rocks themselves form a most interesting series, offering, as they do, an example of magmatic differentiation with no appreciable gaps between the most basic ijolite with 36.99 per cent. silica and sodalite syenite or foyaite with 53.64 per cent. silica. The types recognized and briefly described are: ijolite, ijolite (transition type), biotite-aegirine-ijolite, nepheline syenite, sodalite foyaite or syenite, and cancrinite syenite. There are also dikes of nepheline-syenite-pegmatite and tinguaite. The paper contains one analysis each of ijolite, by N. N. Evans, of hydronephelite from the biotite-aegirine-ijolite, by R. A. A. Johnston, and of schorlomite associated with the above rocks, by F. G. Wait, together with comparison analyses from other sources. Sphene is so abundant in the ijolite as almost to characterize the rock, there being upwards of 4 per cent. of TiO_2.

W. F. HILLEBRAND.

Chlorine in Natural Waters. By WILLIAM S. MYERS. *Ann. Rep. State Geologist of New Jersey, for 1901*, pp. 129–132.—In continuation of the work of obtaining the chlorine figures for the State, additional determinations of total solids and of chlorine are given, also a map showing the normals thus far obtained. The author observes that: "The variations already observed in the New Brunswick, Somerville, Long Branch, Morristown supplies and elsewhere in the State are so great as to suggest a question as to whether the iso-chlors laid down so rigidly for Massachusetts, Connecticut and Long Island are by themselves as valuable guides as many take them to be." W. F. HILLEBRAND.

The Ore Deposits of Monte Christo, Washington. By JOSIAH EDWARD SPURR. *22nd Ann. Rep. U. S. Geol. Survey, Part II*, pp. 777–865.—The geology of this region, situated in the heart of the Cascades, about 40 miles east of Everett, is pretty fully discussed in so far as it bears on economic problems connected with the ore deposits. The ores are found chiefly along joints and fractures, and are most abundant near the surface, there being a rough succession downwards of galena, blende, chalcopy-

Digitized by Google

rite, pyrite, and arsenopyrite. The upper zones, characterized by the three first named minerals, carry more gold and silver than the lower zones, which are characterized by pyrite and arsenopyrite. On various grounds, fully discussed, it is concluded that the minerals were deposited by downward-tending solutions, and that the source of the former was in a general way the rocks in which they by preference occur. There are no analyses.

W. F. HILLEBRAND.

The Coal Fields of the United States. *22nd Ann. Rep. U. S. Geol. Survey, Part III*, pp. 7–571.—The information on this subject, heretofore scattered through numerous publications, is here, under the direction of C. W. Hayes, summarized in a series of papers, eleven in number, by writers, each of whom is familiar with the field he describes. Typical analyses are given in sufficient number to show the general character and range in composition of the coals in most of the fields. W. F. HILLEBRAND.

The Portland Cement Industry in Michigan. BY ISRAEL COOK RUSSELL. *22nd Ann. Rep. U. S. Geol. Survey, Part III*, pp. 629–685.—Illustrative of the text this report contains many analyses, gathered from divers sources, not only of finished cement, but also of the raw ingredients used in its manufacture. There is also a discussion of the origin of fresh water marls in the light of the most recent investigations. W. F. HILLEBRAND.

Chalk of Southwestern Arkansas, with Notes on Its Adaptability to the Manufacture of Hydraulic Cements. BY JOSEPH A. TAFF. *22nd Ann. Rep. U. S. Geol. Survey, Part III*, pp. 687–742.—A paper written in response to a demand for fuller information on these deposits than is afforded by earlier reports. In none of the numerous analyses of chalk and chalk-marls does the magnesia content reach 1 per cent.

W. F. HILLEBRAND.

The Development of Systematic Petrography in the Nineteenth Century. BY WHITMAN CROSS. *Jour. Geol.*, 10, 331–376, 451–499. W. F. HILLEBRAND.

An Analcite-Bearing Camptonite from New Mexico. BY I. H. OGILVIE. *Jour. Geol.*, 10, 500–507.—About four miles north of Las Vegas there rises through the sedimentary beds a little butte of igneous origin. The rock composing it appears in thin section porphyritic, with phenocrysts of augite and hornblende in equal amounts and rare biotite. The ground-mass consists of a network of plagioclase laths with an interstitial filling of an isotropic substance which is supposed to be analcite. Magnetite, ilmenite, and apatite are also present. Large crystals of augite and hornblende are visible to the naked eye. The rock is fresh and the

Digitized by Google

supposed analcite is regarded as primary. The far from satisfactory analysis, by George A. Goodell, of the College of Physicians and Surgeons of New York, is as follows: SiO_2, 44.48; Al_2O_3, 20.43; Fe_2O_3, 9.72; FeO, 2.18; CaO, 10.35; MgO, 5.51; TiO_2, 0.57; K_2O, 1.59; Na_2O, 3.61; Ign., 3.21; Total, 101.65.

W. F. HILLEBRAND.

Holyokeite, a Purely Feldspathic Diabase from the Trias of Massachusetts. By B. K. EMERSON. *Jour. Geol.*, 10, 508–512. —This occurs in "scanty fragments in a bed of agglomerate interstratified in the sandstone, a few feet above the surface of the great Holyoke trap sheet at the east foot of Mt. Tom." An analysis by the reviewer gave: SiO_2, 53.83; Al_2O_3, 16.36; (Fe_2O_3, FeO), 0.89; MgO, 0.13; CaO, 9.81; Na_2O, 7.89; K_2O, 1.58; H_2O—, 0.15; H_2O+, 0.36; TiO_2, 0.86; ZrO_2, 0.02; CO_2, 7.47; P_2O_5, 0.11; S, 0.17; MnO, a little; Cu, 0.14; BaO, SrO, Li_2O, none; Total, 99.77. The mineral composition, on the basis of chemical tests and microscopical evidence, is roughly: apatite, 0.23; dolomite, 0.52; calcite, 16.42; orthoclase, 9.41; albite, 70.25; ilmenite, 1.63; chalcopyrite, 0.40; pyrite, 0.06. The rock may "be looked upon as representing a limiting form of the diabase series where the bisilicates are wholly wanting."

W. F. HILLEBRAND.

Niagara Meteorite. By H. L. PRESTON. *Jour. Geol.*, 10, 518–519.—This siderite, found near Niagara, Forks County, N. Dakota, in August, 1879, weighed when recently purchased 115 grams, was much oxidized, and showed no trace of original crust. "On etching . . . the unoxidized iron, its octahedral structure was strongly marked in the Widmanstätten figures, the kamacite plates being somewhat broad with a second series of markings of hair-like lines upon them about the size of the Neumann lines on the Braunau iron." An analysis by J. M. Davison, of the Reynolds Laboratory of the University of Rochester, gave: Fe, 92.67; Ni, 7.37; Co, 0.13; Total, 100.17. Sp. gr., 7.12.

W. F. HILLEBRAND.

The Salines of North Louisiana. By A. C. VEATCH. *Geol. Survey of Louisiana for 1902*, pp. 41–100.—In this paper quite a number of analyses of brines, by Maurice Bird, are given. In no case does the salt content reach 9 per cent.

W. F. HILLEBRAND.

Subterranean Waters of Louisiana. By G. D. HARRIS. *Geol. Survey of Louisiana for 1902*, pp. 195–252.—A number of analyses of artesian waters from Southern Louisiana appear in this paper.

W. F. HILLEBRAND.

Oil in Louisiana. By G. D. HARRIS. *Geol. Survey of Louisiana for 1902*, pp. 261–275.—But few of many attempts to find oil have been successful.

W. F. HILLEBRAND.

Digitized by Google

Some Additions to the Alunite-Jarosite Group of Minerals. By W. F. Hillebrand and S. L. Penfield. *Am. J. Sci.*, 14, 211–220.—Earlier analyses of alunite and jarosite made them out to be basic hydrous sulphates of potassium with aluminum and ferric iron respectively. Sodium sometimes replaced potassium but usually to a very subordinate extent. This paper describes nearly pure sodium-ferric sulphate (natrojarosite) collected by H. W. Turner, in Soda Springs Valley, Nevada, and a less pure form from Cook's Peak, New Mexico, this last containing also a little lead. The chief interest centers in plumbojarosite, in which divalent lead has almost wholly replaced the univalent metals without producing any essential change in the crystal form. This, too, comes from Cook's Peak. Both plumbojarosite and the natrojarosite from Nevada appear as glistening brown powders made up of very minute isolated tabular crystals which, under the microscope, are seen to consist of combinations of rhombohedron with largely developed basal planes. In mass, the plumbojarosite is distinctly darker than natrojarosite. Natrojarosite (A) containing about 6 per cent. of impurities, and plumbojarosite (B) with over 4 per cent., gave the following results (mean) on analysis:

	Fe_2O_3.	Na_2O.	K_2O.	PbO.	SO_3.	H_2O below 105°.	H_2O above 105°.	X.	Total.	Sp. gr.
A	50.98	6.03	0.35	....	30.96	0.12	11.03	0.47[1]	99.94	3.18(30.5°)
B	42.37	0.21	0.17	19.84	27.06	0.02	9.54	0.94[2]	100.15	3.665(30°)

To account for the isomorphism of such unlike elements as the alkali metals and lead, the suggestion is offered that in molecules like these containing only one atom of lead or two of alkali metal to fifty other atoms, "the alkalies and lead play so small a rôle and the remaining constituents so prominent a part in the complex chemical molecules that the latter control or dominate the crystallization by virtue of what may be called their *mass effect*." The substitution of sodium for potassium in jarosite has brought about a greater variation in the angles of the crystals than the substitution of lead for potassium. W. F. Hillebrand.

METALLURGICAL CHEMISTRY AND ASSAYING.

The John Fritz Medal. *Eng. Min. J.*, June 28, 1902.—The American Society of Civil Engineers, of Mechanical Engineers, and the American Institute of Electrical Engineers and of Mining Engineers will found a gold medal in honor of the eightieth birthday of John Fritz. It is expected to raise $5000 by $10 subscriptions, and the founding of the medal will be celebrated by a dinner in New York City about November. The medal will be awarded annually by a board of sixteen persons, four

[1] X = As_2O_5, SiO_2, CaO.

[2] X = Al_2O_3, SiO_2, CaO, CuO, MgO.

Digitized by Google

from each of the societies named, "for notable scientific or industrial achievement."

J. W. RICHARDS.

Metallurgical Laboratories. BY H. M. HOWE. *Science*, May 16, 1902.—Address at Dedication of Gayley Laboratory, at Lafayette College. Discusses two objections to such laboratories: *viz.*, (1) that professional education should be in the science, should be imparted by thought, reasoning, text-books and lectures, rather than by doing things with the fingers; and that (2) the conditions of commercial practice cannot be reproduced in any laboratory. The first is answered by the contention that students taking up metallurgy in our colleges and universities "'lack the beginning, of every-day conceptions of metallurgical conditions and surroundings' and that 'the great object of laboratory instruction is to supply lacking conceptions.'" The second is answered by saying that the laboratory does not aim to do that, but "by performing a great variety of simple experiments to prepare the student for the study of principles;" and also, "to give a certain skill in the use of instruments of precision of the art, in pyrometry, calorimetry, and the microscopy of metals and alloys." It is in the latter statement that most metallurgists will agree with the address; indeed, many will consider that the *raison d'être* of the metallurgical laboratory. J. W. RICHARDS.

The Education of Metallurgists in Germany. BY J. J. MONAGHAN. *Mines and Minerals*, June, 1902.—A symposium of the technical instruction and examinations required for metallurgists and mining engineers in Saxony, written by the U. S. Consul at Chemnitz. The outline of the work at Freiberg will interest any one contemplating a technical course abroad.

J. W. RICHARDS.

The Ontario Government Assay Office. *Eng. Min. J.*, June 21, 1902.—The Bureau of Mines conducts this office for the analysis of minerals and other products, charging the public only the actual costs of making the tests. The laboratory report recently issued by J. W. Wells, chemist in charge, gives the schedule of very moderate charges for assays and analytical work, a record of over 350 analyses made during 1901, and suggestions as to the minerals for which there is an unfulfilled demand and their chief characteristics by which they may be recognized. J. W. RICHARDS.

Our Coal Production. *Eng. Min. J.*, June 7, 1901.—A preliminary statement issued by the U. S. Geological Survey, places our output of coal in 1901 at 292,000,000 short tons; Great Britain was next to us, with 250,000,000 tons, and Germany third with 152,628,931 metric tons. Of our output, 224,769,091 tons

Digitized by Google

was bituminous coal, and 67,230,909 tons anthracite, making anthracite less than one-fourth of the total. J. W. RICHARDS.

Production of Pig Iron by Grades. *Iron Age*, June 26, 1902. —From report of J. M. Swank to the American Iron and Steel Association. Output in the U. S. for 1901:

Grades.	Gross tons.
Bessemer and low phosphorus	9,589,936
Basic	1,448,850
Forge	639,184
Foundry	3,186,348
Malleable, Bessemer	256,532
Charcoal	360,147
White, mottled, and miscellaneous	97,374
Spiegeleisen and ferromanganese	291,461
Direct castings from furnace	8,522
Total	15,878,354

J. W. RICHARDS.

Standard Specifications for Cast Iron. *Iron Age*, June 19, 1902.—Report of discussion at a recent meeting of the American Foundrymen's Association. Some methods of sampling were proposed and adopted provisionally. The discussion cannot well bear abstracting, and readers interested are referred to the article. A somewhat fuller report is to be found in the *Age of Steel*, July 5, 1902. J. W. RICHARDS.

Standard Specifications for Steel Rails. *Iron Age*, June 19, 1902.—Report of discussion at a recent meeting of the American Society for Testing Materials, followed by discussion on "The Shrinkage Test for Steel Rails," "The Finishing Temperature of Rails," "The Grade of Open-Hearth Steel for Bridges," and "Basic Open-Hearth Steel. Numerous interesting points were brought out, and the article is commended to the attention of those interested in these subjects. J. W. RICHARDS.

Constitution of Cast Iron. *Iron Age*, June 26, 1902.—Report of discussions on this subject at a recent meeting of the American Society for Testing Materials. Dr. A. Sauveur claimed that steel and cast iron are closely connected; that when graphitic carbon is removed from cast iron the residual mass is almost identical with steel; in other words, gray cast iron is a steel matrix with graphite particles, and therefore the accumulated knowledge on steel may be directly applied to the matrix. The presence of graphitic carbon decreases the strength of cast iron. Since the properties of the matrix depend on the combined carbon, the metallographic method will be here found of special service in studying its nature, yielding valuable results in fifteen minutes. J. W. RICHARDS.

Digitized by Google

Cast Iron. By PERCY LONGMUIR. *Age of Steel*, June 28, 1902. Read before American Foundrymen's Association.—Combined carbon is the controlling factor of the strength of cast iron, 0.10 per cent. giving "dead soft;" 0.20 per cent., "soft;" 0.50 per cent., highest tensile strength; 0.70 per cent., highest transverse strength. These figures are for irons of normal qualities. High sulphur usually accompanies high combined carbon. Silicon usually varies between 0.5 and 2.5 per cent., and produces softness; 0.60 per cent. gives maximum hardness; 0.80 per cent., maximum crushing strength; 1.00 per cent., maximum density; 1.40 per cent., maximum crushing, tensile and transverse strength; 1.80 per cent., maximum tensile strength, only; 2.50 per cent., maximum softness and general working qualities.

J. W. RICHARDS.

Effect of Melting Steel with Iron in the Cupola. By H. E. DILLER. *Age of Steel*, June 28, 1902. Read before American Foundrymen's Association.—Melted different proportions of steel with pig iron, adding sometimes ferrosilicon to bring the silicon up, and made tensile and transverse tests of the product. The mixture of ingredients was thorough. Results show that 25 per cent. of steel added 50 per cent. to the strength of the iron, and $12\frac{1}{2}$ per cent. of steel, approximately 25 per cent. Thirty-seven and a half per cent. of steel did not give as good results as 25 per cent., the latter appearing to be near to the limit of improvement possible.

J. W. RICHARDS.

Removal of Hammer Scale. *Age of Steel*, June 28, 1902.—A. K. Eaton patents the removal of hammer scale by using as a pickling liquor a solution of sodium bisulphate and stannous chloride, the solution being supposed to contain, by double decomposition, some stannous sulphate and free hydrochloric acid. This solution dissolves the scale without attacking the bared metal.

J. W. RICHARDS.

The World's Copper Production. By H. J. STEVENS. *Mines and Minerals*, May, 1902.—The total production of the world, in 1901, was 541,811 long tons, of which the United States produced 281,111 tons; Spain, 55,000 tons; Chili, 33,000 tons; Japan, 30,000 tons; Mexico, 28,000 tons; Australasia, 26,000 tons; Germany, 24,000 tons; and Canada 22,500 tons. Canada is, without question, one of the coming copper countries, increasing its output 165 per cent. over 1900. Canada will make more copper in 1902 than the United States made in 1880. Since 1880, the United States has increased its production tenfold. The total production for the years 1800 to 1900, in the world was 9,507,299 long tons, of which over one-third, 3,708,901 tons was produced in the last decade, and seven-eighths in the last three decades. The world's largest mines, with annual productions in millions of pounds are

Digitized by Google

the Anaconda (100), Calumet and Hecla (93), Rio Tinto (85), Boston and Montana (95), Mansfield (45), United Verde (35), Copper Queen (35). J. W. RICHARDS.

The Copper Region of North California. BY J. S. DILLER. *Eng. Min. J.*, June 21, 1902.—Within the last five years this district has taken rank among the great copper-producing regions, producing, in 1900, over 2,800,000 pounds, and being surpassed only by Montana, Lake Superior, and Arizona. The copper region is in Shasta County among the hills about the northern end of the Sacramento Valley. The ore deposits are auriferous quartz veins, sulphides in contact zones, or sulphides in shear zones. About a dozen mines are in the quartz veins, but their output is small. Several promising mines are opened on the sulphides in contact zones, the ores being chalcopyrite and pyrrhotite, with magnetite and limonite. The principal mines are on the shear zones, in igneous rocks, the ore bodies being frequently solid pyrite and chalcopyrite, with chalcocite and occasionally bornite, carbonates and native copper, and sphalerite. Great depths have not been reached, but much diamond drill work has been done and the prospects of large developments are good.
J. W. RICHARDS.

An Adobe Reverberatory Furnace. BY J. GROOS. *Eng. Min. J.*, June 14, 1902.—When necessary for a make-shift, it is quite possible to erect a serviceable reverberatory furnace of no other materials than adobe, stones and wood. The adobe bricks are conveniently 9 inches wide, 18 inches long, and 4 inches thick, with just enough straw to hold them together, and then simply sun-dried. The construction is heavy. The foundation is of stone, the hearths are 10 by 10 feet, with 3-feet walls, making the whole furnace 16 feet wide by some 41 feet long. The arch starts 9 inches above the bed and has 12 inches rise. Buck-stay rods of iron are used, one inch in diameter, placed in pipes to permit changing easily and prevent them being burned out. The furnace is fired gradually for several days to dry it out. J. W. RICHARDS.

The Chase Roasting Furnace. *Eng. Min. J.*, June 7, 1902.—Contains three fire-clay troughs, one above the other, with screw conveyors turning in each. The ore is passed along the upper trough, falls through an opening into the middle one, along it, then drops on to the lower one, from the further end of which it is discharged from the furnace. The troughs are 12 feet long, and the set of troughs described will handle 10 tons of material per day. It is designed particularly for acting automatically and continuously and giving a dead roast. The conveyors consist of cast-iron flanges of 14 inches diameter and pitch, interlocking on a hollow-drawn steel axis through which water circulates, thus

Digitized by Google

preventing it from warping. Tests are given of pyrites cinder roasted from 5.07 per cent. to 1.17 per cent. sulphur at the rate of 9.6 tons in twenty-four hours, with less than one ton of fuel.
J. W. RICHARDS.

A Review of Alloys. BY G. THURNAUER. *R. R. Gazette*, May 9, 1902. Paper read before Western Railway Club.—By adding one metal to another, the strength of the latter is generally increased up to a certain point. Tin, aluminum or zinc added to copper are examples. By adding a third metal, not infrequently a further increase in strength can be accomplished. The hardness of a metal also generally increases by adding another metal. The ductility of metals is generally greater the purer they are; temperature is of some influence, for copper and zinc are more ductile at a high temperature, and brass and German silver less. Alloying generally decreases the conductivity for heat and electricity and decreases the melting-point. *Copper-tin alloys*: As tin increases to 10 per cent., the color becomes yellow, and approaches gray at 30 per cent., the strength suddenly diminishing as the color changes from yellow to gray. Alloys containing less than 20 per cent. tin are the only ones valuable to the engineer. The useful bronzes contain 9 to 15 per cent. of tin, while the strength is greatly increased by small additions of such deoxidizing agents as phosphorus, silicon, manganese or aluminum. *Copper-zinc alloys*: No known material, perhaps not even excepting iron, can be given so wide a range of quality or so great a variety of uses. Common brass contains 30 to 33 per cent. of zinc, with a little lead often added to soften and cheapen it, and tin in small proportion to strengthen it. The copper-tin zinc alloys or "kalchoids" are very strong, hard combinations. Regarding the influence of small quantities of impurities upon the qualities of certain *antifriction metals*, $^1/_{10}$ to $^1/_{20}$ per cent. of zinc in a lead antimony tin alloy will greatly interfere with the production of clean castings, because of the tendency to form dross; $^1/_{10}$ to $^1/_5$ of a per cent. of iron in a tin-copper antimony alloy will do like mischief. A small quantity of arsenic in either of these alloys will cause large, lamellar and brittle crystals to be formed, which make the metals useless for the intended purposes. The writer next discusses the modern information and theories as to the constitution of alloys, and Charpy's conclusions on the proper texture of alloys for bearing metals.
J. W. RICHARDS.

New Plant of the American Smelting and Refining Company. *Eng. Min. J.*, June 28, 1902.—This new plant, at Murray, Utah, a few miles south of Salt Lake City, is the latest construction for silver-lead smelting in the United States, and may be considered as embodying the best experience in that industry. The works is built on level ground, all the elevations required being obtained

Digitized by Google

by mechanical lifts, trestles and inclines. The roasting plant comprises a crushing mill and two furnace houses, one equipped with Brueckner furnaces and the other with hand-raked reverberatories. These furnaces have roasting hearths only, step-grates and closed ash-pits, the coal being fed through hoppers. The smelting department contains 8 furnaces, each 48 by 160 inches at the tuyeres, with 10 tuyeres on a side. Each section of cast iron tuyere jacket is 16 inches wide, with the tuyere in the middle and 6 feet long. The furnaces are 30 feet apart, center to center. The slag from the matte settling boxes overflows into single bowl Nesmith pots, handled by small locomotives. The plant chimney is 20 feet in diameter and 225 feet high. The ore yard and other places where tramming is to be done are laid with concrete on top of a bed of broken slag; the same is used in the roasting furnace houses; the smelting house has an iron floor.

J. W. RICHARDS.

The Losses of Silver in Cupelling. BY W. H. KAUFFMAN. *Eng. Min. J.*, June 14, 1902.—Experiments were made to determine the losses (1) with the same amounts of silver and varying amounts of lead, (2) with varying amounts of silver (25 to 200 milligrams), (3) the influence of copper, (4) the influence of varying temperatures, (5) the influence of various grades of cupels. Cupels were used made with water only (water cupels), with 2 per cent. of pearl-ash (potash cupels), and with 1 per cent. of borax (borax cupels). Some of the results are unreliable, because no pyrometer was used and the temperature merely estimated, and temperature is the greatest factor in the loss. The conclusions arrived at are: (1) The percentage loss of silver is greater in cupelling small amounts; (2) The loss is greater the greater the amount of lead used; (3) The losses are not increased by the presence of copper up to the same weight as the silver; (4) The kind of cupel used made no difference on the losses; (5) Excessive heat causes greater losses than large amounts of lead; (6) The smallest losses occur when a small lead button is cupelled at a low temperature, reaching as a minimum 1 per cent. of the weight of silver treated. J. W. RICHARDS.

Aluminum. *Eng. Min. J.*, June 7, 1902.—The production in the United States in 1901 was from one company, the Pittsburg Reduction Company, whose two plants at Niagara Falls produced 7,150,000 pounds, of a value, unmanufactured, of $2,360,000. The total imports of all forms of aluminum were valued at $109,748. J. W. RICHARDS.

An Aluminum Plant at Massena, N. Y. *Age of Steel*, June 7, 1902.—The water-power construction, rendering 75,000 H. P. available, was completed several months ago, but the expected industries failed to arrive. The Pittsburg Reduction Company has

Digitized by Google

bought a site of 100 acres, and will erect two buildings covering 15 acres, at an estimated cost of $500,000. In this plant, aluminum will be manufactured by the Hall process, about 600 men being employed. Later, it is proposed to erect finishing factories for working the metal into commercial shapes. The total investment will approximate $1,000,000.

J. W. RICHARDS.

Bauxite. *Eng. Min. J.*, June 21, 1902.—In 1901, the United States produced 18,905 long tons of bauxite, the bulk coming from Georgia, the rest from Alabama and Arkansas. The imports from the South of France were exceptionally large, because of low ocean freights; 18,313 tons were imported in 1901. The Pittsburg Reduction Company is installing a large plant at Bauxite, Saline County, Arkansas, and will increase the production of that state very materially in 1903.

J. W. RICHARDS.

Bauxite Mining in Georgia. BY A. W. EVANS. *Mines and Minerals*, June, 1902.—The origin of bauxite seems to be an open question; it is often intimately associated with iron and manganese ores in dolomite. In Georgia, the deposits occur upon the sides of gently sloping ridges, especially in coves, and very rarely upon detached valley ridges, at elevations of 700 to 1,100 feet above sea-level. The surface indications are generally clear; the ground is yellow with but little flinty covering, pebbles of bauxite are found. At Harrisburg is a deposit on the western slope of a small ridge measuring 150 feet by 100 feet by 36 feet deep, giving a deposit of 540,000 cubic feet or 42,120 tons, assuming a mean specific gravity of 2.5. As about 25 per cent. is lost in preparing it for market, the deposit will yield about 31,590 tons of commercial bauxite. The mineral is mined by the open cut method, and is carried in a side-dump car to the washer, which is a submerged double log washer, consisting of two 12-inch square logs, each carrying chilled cast lugs placed spirally upon them. They revolve in opposite directions 10 revolutions per minute. The upper end is 27 inches high, and water is here fed in by a $2^1/_2$ inch nozzle. After washing, the mineral is placed in a rotary drier, 36 inches in diameter by 36 feet long, mounted on cast rollers 16 inches in diameter, and revolved by a sprocket chain around it. The flue end is 6 inches higher than the grate end, and the fuel is wood. The crude bauxite averages 62 per cent. alumina, 1.5 per cent. ferric oxide, 2 per cent. silica, and 2 per cent. titanic oxide. The water is driven off by heating to redness.

J. W. RICHARDS.

BIOLOGICAL CHEMISTRY.

Experimental Observations on Pancreatic Digestion and the Spleen. BY LAFAYETTE B. MENDEL AND LEO F.

Digitized by Google

RETTGER. *Am. J. Physiol.*, 7, 387–405.—These observations were made upon dogs. Extracts of the spleen, prepared from the organ when congested during digestion, increase the proteolytic power of the pancreas. This was demonstrated *in vitro* and *in vivo*. Injections of defibrinated blood from the splenic vein are likewise effective. A boiled extract of the spleen is ineffective. Extracts of other tissues (liver, pancreas) apparently have little action. The same is true of pure saline infusions. The precipitate produced by alcohol in active spleen extracts contains a trypsinogenic substance. The extracts of the pancreas of splenectomized dogs are not always free from trypsin. Whether this is entirely attributable to an extrapancreatic transformation of trypsinogen is not determined.

The conclusion drawn from the experimental work is that a view of the available experimental data fails to reveal evidence which absolutely controverts the Schiff-Herzen hypothesis that the spleen may yield an agent which can react directly within the living pancreas in elaborating trypsin. What physiological importance, if any, is attached under normal conditions to this reaction is at present uncertain. At any rate, in the light of recent investigation, it can no longer be accepted as the only factor in the conversion of the pancreatic zymogen. Favorable conditions for the activity of the pancreatic enzyme in the intestines are thus always assured. F. P. UNDERHILL.

On the Effect of the Digestion of Gelatine on Its Styptic Properties. BY HORATIO C. WOOD, JR. *Am. Med.*, May 3, 1902; *Abst. N. Y. Med. Record*, 61, 743.—Pepsin digestion of gelatin does not destroy its coagulating effect on the blood. The resulting product is diffusible and, therefore, capable of absorption. Gelatose seems to antagonize the action of peptone, if administered in sufficient quantity. F. P. UNDERHILL.

The Influence of Synthetic Remedies on Various Urine Tests and the Errors They Often Cause; Including, Also, a Few Drugs. BY FREDERICK T. GORDON. *Therapeutic Monthly*, 2, 246–253.—The drugs and chemicals that affect the urine may be, for the sake of convenience, divided into groups according to the effect produced, *i. e.*, the reactions they afford simulating those of the normal or abnormal secretions, in other words according to the fallacies they introduce into the analysis of the urine: Those which cause a reaction simulating the reaction of (1) albumen, (2) sugar, (3) uric acid and urates, (4) biliary matter, (5) indican, (6) acetone, diacetic acid, (7) blood, (8) chlorides, (9) phosphates, (10) sulphates. The several classes are treated at length in this article, and at the end a table is given containing all the substances which would simulate any of the reactions given in the above groups. F. P. UNDERHILL.

Digitized by Google

The Nutritive Value of Alcohol. By FRANCIS G. BENEDICT. *Boston Med. and Surg. J.*, 147, 31.—Being a review of the literature on the subject up to date, and giving as a conclusion that to alcohol must be accorded a value as fuel and a protector of body material. F. P. UNDERHILL.

Observations on the Vegetable Proteolytic Enzymes, with Special Reference to Papain. By LAFAYETTE B. MENDEL. *Am. J. Med. Sci.*, 124, 310–319.—A review of the literature of vegetable proteolytic enzymes is here given, with the results of experiments carried out with the enzyme, papain, contained in the juice of the papaw (*carica papaya*). This enzyme fails to conform with any of the known types of enzymes and is placed in a class by itself. For the details of the experimental work, see Mendel and Underhill, *Trans. Conn. Acad. Arts and Sci.*, October, 1900, Vol. 9. See, also, abstract, this Journal, 24, R. 27. F. P. UNDERHILL.

The Formation of Films on Heated Milk. By LEO F. RETTGER. *Am. J. Physiol.*, 7, 325–331.—The formation of film on heated milk is dependent upon proteid in the milk. This proteid is caseinogen. The presence of fat facilitates film formation, but is not essential. While surface evaporation facilitates film formation, it is not necessary. F. P. UNDERHILL.

Experiments to Determine the Possible Admixture or Combination of Fat or Fatty Acids with Various Proteid Products. By E. R. POSNER AND WILLIAM J. GIES. *Am. J. Physiol.*, 7, 331–340.—The following products were examined: Several different preparations of tendomucoid, osseomucoid, chondromucoid, bone collagen, tendon gelatin, tendon collagen, bone gelatin, elastin, cocoa edestin, albuminate (myosin), egg albumen, Witte's peptone, somatose, and chloralbacid.

The methods used were those of Nerking (*Arch. ges. Physiol.*, 85, 330), and Dormeyer (*Arch. gès. Physiol.*, 61, 341 and 65, 102).

The results of the experiments lead to the conclusion that the above proteids of the simple compound and albuminoid type, which were prepared by the best methods now in use are not "fat proteid" compounds. It is obvious also that these substances bear no resemblance to products of the lecithalbumin type. F. P. UNDERHILL.

Is Adrenalin the Active Principle, of the Suprarenal Gland? By T. B. ALDRICH. *Am. J. Physiol.*, 7, 359–369.—All concentrated aqueous extracts of the suprarenal gland reduce Fehling's solution on boiling. The adrenalin obtained from a certain amount of the aqueous extract reduces Fehling's solution approximately in the same proportion as the original extract from which it was obtained. The mother-liquor, after removal of the greater part of the adrenalin, except in comparatively large

Digitized by Google

amounts, does not reduce Fehling's solution. Adrenalin is not a reduced form of the native principle, since it was obtained without the use of a reducing agent, such as hydrogen sulphide. Adrenalin is the same whether obtained by using sodium carbonate or ammonium hydroxide as a precipitant. Epinephrin and other questionable products obtained from the gland must be an oxidized or at least, a changed form of adrenalin, the active principle, since they do not reduce Fehling's solution. Adrenalin is identical with the copper sulphate reducing body, the blood-pressure raising substance, as found in the gland and is, therefore, the active principle of the same, and not a modified or changed form as Abel contends (see *Johns Hopkins Hospital Bull.*, 7, 337; also abstract *this Review*). F. P. UNDERHILL.

On the Composition and Chemical Properties of Osseoalbumoid with a Comparative Study of the Albumoid of Cartilage. BY P. B. HAWK AND WILLIAM J. GIES. *Am. J. Physiol.*, 7, 340–359.—1. Osseous tissue contains a residual proteid substance, obtainable after hydration of the collagen, which is neither keratin nor typical elastin, although it resembles the latter body. This substance is present in bone in only comparatively small proportion, though apparently in greater relative quantity than the corresponding constituent of cartilage. The average percentage elementary composition of the purest products was found to be as follows, calculated for ash-free substance:

C.	H.	O.	H.	S.
50.16	7.03	25.46	16.17	1.18

The analyzed products were free from organic phosphorus. The substance seems to be very similar to some of the albumoids, particularly to that of cartilage. It has, therefore, been termed osseoalbumoid. No attempts have been made to ascertain its location in the tissue, but it appears to be identical with the substance referred to erroneously by Broesike as keratin and found by him in the lining of the lacunae and canaliculi. It is possible, also, that the elastic fibers of the bone have contributed substance to the preparations.

2. Further investigation of the qualities of chondroalbumoid confirmed most of Mörner's conclusions regarding it. In addition, its elementary composition has been determined, with the following percentage results for ash-free substances.

C.	H.	O.	N.	S.
50.46	7.05	25.68	14.95	1.86

This product is likewise devoid of phosphorus in organic combination. F. P. UNDERHILL.

A Case of Voluntary Erection of the Human Hair and Production of Curtis Anserina BY S. S. MAXWELL. *Am. J. Physiol.*, 7, 369–380.—These experiments were carried out upon a human subject and led to the following conclusions: The

Digitized by Google

erection of the papules can be brought about voluntarily. The voluntary control of the *arrectores pilorum* seems to be correlated with an inherited unusual neuro-muscular and dermal development. The erection of the hairs is in this case accompained by vaso-motor changes of such nature that the vaso-constrictors are stimulated, while the *arrectores pilorum* are contracted. Dilatation of the pupil occurs during the period of erection. The dilatation is most marked at the beginning of erection and is very inconstant as to amounts. Modifications of the respiratory movements usually accompany the phenomenon, but are not necessarily connected with it. The *arrectores pilorum* do not contain striated muscle. F. P. UNDERHILL.

Note upon the Effect of Calcium and of Free Oxygen upon Rhythmic Contraction. By S. S. MAXWELL AND J. C. HILL. *Am. J. Physiol.*, 7, 409–412.—The experiments were always made in pairs in the following way: A frog was pithed and the oesophagus was dissected out and split into right and left halves. One-half was put into an "oxygen" solution, the other into a "boiled" solution. Small Stender dishes, with very closely fitting covers, were used. Microscopic examinations were made from time to time by teasing off upon a slide small portions of the ciliated membrane. If the first preparation showed no ciliary motion, a second mount was made, and so on, until it was certain that ciliary motion was present or absent.

For the whole series of experiments, the average duration of ciliary activity in the "boiled" solution was thirty-one hours; in the "oxygen," twenty hours. F. P. UNDERHILL.

On the Lymphagogic Action of the Strawberry, and on Post-Mortem Lymph Flow. By LAFAYETTE B. MENDEL AND DONALD R. HOOKER. *Am. J. Physiol.*, 7, 380–387.—These experiments were carried out upon dogs. The details of the methods employed may be found in *Am. J. Physiol.*, 2, 142, Chittenden, Mendel and Henderson. The injections consisted of an aqueous extract of the strawberry and were prepared by boiling desiccated berries with water and straining through a cloth.

The action produced by such injections of strawberry extract resembles that produced by other typical lymphogogues of Heidenhain's first class. The lymph continued to flow for four hours, after death of the animal, without any external mechanical assistance. The conclusion is drawn that the specific importance of the living, or surviving cell, for such physiological phenomena is not to be denied. F. P. UNDERHILL.

On the Oxidative Properties of the Cell-Nucleus. By RALPH S. LILLIE. *Am. J. Physiol.*, 7, 412–422.—The experiments here presented were made upon the various organs and

Digitized by Google

tissues of the frog—liver, spleen, pancreas, lung, kidney, testes, ovary, the various regions of the intestinal tract, the striated muscle, the various regions of the brain and spinal cord, and certain lymphatic structures, especially the thymus and the ventral "gill-vestiges."

The method employed was to subject thin slices of alcoholic and fresh tissues to the action of various solutions for varying periods of time. The reactions which took place were all color reactions and were the results of oxidative changes. In general, it was observed that the above oxidations take place most rapidly in those organs, and in those regions of organs which contain the most numerous and most densely aggregated nuclei. Fresh tissues differ also from alcoholic tissues in possessing distinctly greater oxidative activity; in other respects, the properties of the two differ but slightly under the conditions of experimentation. A general similarity exists between the distribution of nuclear matter in various tissues of the frog and the distribution of colored synthetic products formed within the same tissues by their oxidative action. In a number of instances (especially liver and kidney cells and blood corpuscles), the colored oxidative products are seen to be deposited chiefly in and about the nucleus, especially at the surface of contact between nucleus and protoplasm. F. P. UNDERHILL.

Further Experiments on the Antitoxic Effect of Ions. BY HUGH WILSON. *Am. J. Physiol.*, 7, 405–409.—In these experiments the gastrocnemius muscles of the frog were employed, and the purpose was to apply the facts already worked out by Loeb to the prolongation of the life of the muscular tissue.

The method of investigation was to use the muscles in pairs, one muscle being placed in a Stender dish containing 100 cc. of the solution whose toxic effect was to be determined. The other muscle was placed in 100 cc. of the same solution, to which were added traces of the salts whose ions were to be tested for their antitoxic effects. To determine the time of death, electrical stimuli were applied. Small amounts of salts with mono- bi- or trivalent kations diminish the poisonous effects of pure sodium chloride, lithium chloride, ammonium chloride, or potassium chloride solutions. For salts with monovalent kation 10 cc. $\frac{m}{8}$ for salts with bivalent kation, 1 cc. of $\frac{m}{32}$, and salts with trivalent kation, 1 cc. of $\frac{m}{384}$, added to 100 cc. $\frac{m}{8}$ or $\frac{m}{4}$ of sodium chloride, lithium chloride, ammonium chloride or potassium chloride, gave the best results. Sodium salts with anions of higher valency when added to solutions of sodium chloride or

Digitized by Google

lithium chloride have no antitoxic effect, but have a slight antitoxic effect, when added to ammonium chloride or potassium chloride.

F. P. UNDERHILL.

SANITARY CHEMISTRY.

The Effect of Pickling Liquids upon Sewage Treatment. BY HARRISON P. EDDY, Supt. of Sewers, Worcester, Massachusetts. *J. Soc. Chem. Ind.*, **21**, 334–337 (1902).—The city of Worcester is the seat of large iron industries, and large quantities of pickling liquors are discharged into the sewers. The amount received at the purification works varies, but the daily average for the week ending September 14, 1900, was 37 tons of copperas and 7 tons of free sulphuric acid. This amounts to 92.3 parts copperas or 32.5 parts per 100,000 calculated as sulphuric acid. The treatment of a sewage of this character is difficult and expensive. Chemical treatment, the addition of lime, will remove the iron and free acid, but the amount of lime required is large, 1,800 pounds per 1,000,000 gallons, and the precipitate or sludge formed is very voluminous and difficult to treat. This process also only removes the suspended organic matter and is not a complete method for the treatment of sewage.

Bacterial Method.—Sewage containing free acid is not well adapted to bacterial treatment. The action of the septic tank in breaking up and decomposing the organic matter in the sewage is not so complete as with domestic sewage. The iron sulphate is reduced to insoluble iron sulphide, a large amount of which is retained in the tank, but more or less is always found in the effluent. With the open septic tank, quite an amount of soluble iron sulphate is also found in the effluent; this is probably due to the oxidation of the iron sulphide brought to the surface of the liquid by gas formation, and thus brought in contact with air.

Intermittent filtration method of treating the crude acid iron sewage removes only about one-half of the iron and the beds clog comparatively quickly.

If a surface of a filter which has become clogged is examined, it is found to contain a large amount of ferrous oxide which, on exposure to air, rapidly changes to ferric oxide. After the surface of such a filter is raked or ploughed, or even allowed to rest for a number of days, very large amounts of iron will be found in the effluent when the bed is again placed in operation.

Acid iron sewage which has received chemical treatment, is easily treated on intermittent filtration beds.

The article contains analytical data in tabulated form, showing the effect of septic treatment of acid iron sewage; the amount of iron sulphate retained by intermittent filtration beds; the amount of iron sulphate that can be washed out of such a bed by treating

Digitized by Google

it with city water, and the analysis of the sand in a bed, the latter showing that the iron is almost wholly retained in the upper six inches. LEONARD P. KINNICUTT.

The New Chemical Precipitation Plant at Jamaica, L. I. *Eng. Record*, 45, 606 (1902).—The plant is designed for treating 2,000,000 gallons of sewage per day. The interesting point in the method to be employed is in the use of chlorine as a disinfectant after the precipitation of the suspended matter in the sewage by lime and ferric chloride. The sewage after the addition of the lime and ferric chloride will pass through 1500 feet of settling tanks, and chlorine generated by the action of dilute sulphuric acid on salt and manganese dioxide is to be forced by compressed air through perforated lead pipes into the liquid as it leaves the tanks. LEONARD P. KINNICUTT.

The Action of the Septic Tank on Acid Iron Sewage. BY LEONARD P. KINNICUTT AND HARRISON P. EDDY. Third Annual Report of the Connecticut Sewage Commission. pp. 5–32. *Eng. News*, 47, 445–448.—The septic tank used was an iron pressure tank, 14 feet long, 5 feet in diameter and the sewage level being maintained at 4 feet, gave a liquid capacity of 1762 U. S. gallons. The sewage was the Worcester sewage containing on the average 16.5 parts of solid matter in suspension, and 57.7 parts of solid matter in solution in 100,000 parts. The free ammonia averaged 1.8, albuminoid ammonia 0.64, ferrous sulphate 15.7, and free acid, in terms of sulphuric acid 10.3 parts per 100,000.

The experiments extended from October, 1900, to January, 1902. During all this time half-hour samples of the sewage and effluent were taken day and night, mixed and sterilized at the end of each twenty-four hours, and at the conclusion of each week, aliquot portions of the twenty-four-hour samples were thoroughly mixed and the resultant mixture analyzed. The amount of gas evolved each day was noted, sampled and analyzed. The amount of deposit in the tank was measured, and its composition, as well as the composition of the crust, determined. The air temperatures and the temperature of the sewage and effluent were also taken. The results of this work are given in tabulated form and compared with results obtained in England and America. The general conclusions of all these experiments, as stated by the authors, are as follows:

"Though we consider this paper as a preliminary one, principally a record of data obtained during the past fifteen months, and though the observations and experiments of the next year may change or modify some of the results, we think the results so far obtained point to the following conclusions as to the action of a septic tank on an acid iron sewage similar to Worcester sewage:

Digitized by Google

That about one-fourth of the total solid matter is removed by the passage of the sewage through a septic tank.

That the amount of soluble matter removed, equaling in Worcester about 21 per cent. of the total soluble matter, is greater than the amount usually found to be removed from a sewage by septic tank action.

That the amount of suspended matter removed, found to be about 25 per cent. of the total suspended matter, is very much less than the amount removed by the same process from a sewage containing less manufacturing waste.

That the above results are due to the change of the soluble sulphate of iron in the sewage into the insoluble sulphide of iron, and to the fact that a comparatively large amount of iron sulphide is carried out of a septic tank in the effluent.

That the action of a septic tank removes a large amount of iron from an acid iron sewage.

That the amount of organic matter removed, 26 per cent. in Worcester sewage, is much less than is removed by the same process from an alkaline domestic sewage.

That though a greater amount of organic matter seems to be removed from the sewage in the warm months than in the cold months, the results, possibly owing to methods of sampling, show no direct relationship between the organic matter removed and the temperature.

That the amount of gas given off depends greatly upon the amount and character of the sludge at the bottom of a tank, and the amount given off is a measure of the total amount of bacterial action taking place, and is not a measure of the amount of organic matter being removed at any given time from the sewage.

That the amount of gas evolved from a septic tank depends upon the temperature and that it is less in winter than in summer.

That the amount of gas evolved from the septic tank at Worcester, for the past year, 2.2 gallons per 100 gallons of sewage passing through the tank, is probably less than would be obtained from a tank where the sludge contains a greater amount of organic matter.

That the gas given off from a tank through which acid iron sewage is passing is a mixture of methane, nitrogen, and carbon dioxide; containing little, if any, hydrogen.

That the amount of sludge changed into soluble or gaseous substances, 28 per cent. with Worcester sewage, is probably less than would usually be the case, on account of the large amount of iron sulphide in the sludge.

That the sludge in a septic tank contains less organic matter in the autumn than in the spring.

That the crust contains a much larger amount of organic matter than the sludge.

That the formation, non-formation, and disappearance of the

Digitized by Google

crust on top of the liquid in a septic tank appears to be an incident rather than a result of bacterial action.

LEONARD P. KINNICUTT.

Intermittent Filtration of Sewage at Brocton, Mass., during 1901. BY GEORGE E. BOLLING. Annual Report of the City Engineer and the Sewage Commissioners, City of Brocton, Mass. Year ending November 30th, 1901, pp. 48–58.—The plant was constructed in 1896, and consists of twenty-eight one-acre beds, ten of which are underdrained at a depth of 8 feet. The amount of sewage treated averaged 703,750 gallons per day, and the amount of sludge 85,200 gallons per day. The amount of purification calculated from the albuminoid ammonia and oxygen consumed equaled 98 per cent. The amount of albuminoid ammonia in the effluent averaged 0.0236 and the oxygen consumed 0.28 part in 100,000 parts. The cost of labor on the beds averaged $9.30 per million gallons of sewage treated.

LEONARD P. KINNICUTT.

Streptococci, Characteristic of Sewage and Sewage-Polluted Waters, Apparently Not Hitherto Reported in America. BY C. E. A. WINSLOW AND MISS M. P. HUNNEWELL. *Science N. S.*, 15, 827–829 (1902).—A. C. Houston, in the Report of the Medical Officer to the English Local Government Board 1898–99, stated that he had isolated both streptococci and staphylococci from sewage effluents and impure waters and in the report for 1899–1900 showed that streptococci seemed always to be present in water containing recent animal pollution.

The authors of this paper after stating that the above facts appear to have attracted but little attention in America, show, by the analyses of various polluted waters in the neighborhood of Boston, that the occurrence of streptococci seems to be constant and significant. They also state that in all sanitary bacteriological examinations of water, the occurrence or absence of this group of bacteria should be noted. LEONARD P. KINNICUTT.

PATENTS.

It may be of interest to note that the Bulletin No. 210 of the twelfth census of the United States contains as an appendix a digest of chemical patents from the beginning to 1901, so that, taken in connection with these abstracts, a complete list of United States Chemical Patents may now be had.

MARCH 25, 1902.

696,271. Carrie Renstrom, Seattle, Washington. Assignor to Aztec Tempered Copper Co., same place. **Hardens copper** or alloys of copper by heating it to the melting-point of tin for three minutes, and while in a heated condition sprinkles sulphur on the

Digitized by Google

same, then subjects the mass to a blue vitriol bath, then reheating and cooling it. Time and temperature of heating may be varied.

696,274. Eugen Schilz, Johannesburg, So. African Republic. Cyanide process of **extracting precious metals.** Mixes barium peroxide with the metal-bearing ore, then reacts on the mixture with an alkali cyanide.

696,379. Jesse Peterson, Lockport, N. Y. Assignor to Indurated Fiber Co., same place. **Indurating fiber ware.** Soaks in a mixture of corn oil and creosote, bakes, sands, varnishes, and bakes again.

APRIL 1, 1902.

696,410. Abram Broodsky, Montreal, Canada. Process of **indurating plaster of Paris.** Immerses the article in a saturated boiling solution of alum to which hot vinegar is added from time to time.

696,423. Oscar F. J. Dowez, Enghein, Belgium. **Devulcanizing India rubber.** Calcines lime strongly, sifts it into water, kneads in the rubber, boils, removes rubber and washes it.

696,469. Robert McKnight, Philadelphia, Pa. **Treating ores.** Ores containing precious metals in flour state, or larger particles coated with carbonates are mixed with a refractory metalloid as sulphur and an alkaline or alkaline earth haloid salt and agitated with air till CO_2 is driven off, the base changed to a sulphide or sulphate first, then to an oxide, the haloid salt is decomposed and the halogen combined with the finer particles of the precious metals and the alkaline metals combined with oxygen and the metalloid to form a stable oxy salt, while the volatilized haloid salts of the precious metals are collected, and the cleaned larger particles amalgamated.

696,515. Bertrand S. Summers, Chicago, Ill. **Retting vegetable fibers.** First soaks them in hot water under pressure to form a retting liquid, then precipitates the gum from this liquid by lead oxide and filters out the oxide and gum.

696,609. Heinrich Thron, Frankfort-on-Main, Germany. Assignor to Vereinigte Chinin Fabriken, Zimmer and Co., same place. **Succinic acid ether of cinchona alkaloids.** Soluble in alcohol, ether, and chloroform, difficultly soluble in water, forming salts with organic and inorganic acids, melting at 97° C., crystallizing in nearly tasteless needles.

696,632. Prosper M. C. Greiner, New York, N. Y. Assignor to Grenier Art Co., West Virginia. **Photographic fabric,** made by coating the fabric with an extract of Chondrus crispus, citric acid and ammonium chloride, then sensitizing.

696,751. Christopher Ris, Basle, Switzerland. Assignor to Aniline Color and Extract Works, formerly John R. Geigy, same

Digitized by Google

place. **Blue sulphur dye.** The indophenol from *p*-phenylenediamine and carbolic acid is treated with a normal sulphite to form a new sulpho acid of dimethyl-*p*-amino-*p*-hydroxydiphenylamine, and this product is heated with alkaline polysulphides. Almost insoluble in water and sodium carbonate, ether and benzene, and diluted mineral acids, soluble blackish blue in concentrated sulphuric acid, and pure blue in sodium sulphide, an excess giving clear gray-violet, dyeing with sodium sulphide and salt pure blue.

696,796. John V. Brauch and Bernard Hemann, Belleville, Ill. **Coating for nails.** Crude turpentine 40, linseed oil 60 per cent.

696,800. Alexander Classes, Aachen, Germany. **Converting cellulose into sugar.** Heats cellulose and sulphurous acid in closed vessel to 120° to 145° C. introduces chlorine to convert part of the sulphurous acid to sulphuric acid to effect the conversion of the mass, then boils with water in an open vessel.

APRIL 8, 1902.

696,941. Georges Charpey, Montlucon, France. Assignor to Cie. des Forges de Chatillon, Commentary et Neuves Maisons, Paris, France. **Armor plate.** Contains nickel, 5 per cent., carbon 0.1 to 0.15 per cent., cemented on one face only, hardened at 750° to 800° C. without subsequent annealing; may have 0.5 per cent. of chromium.

696,949. Chester B. Duryea, New York, N. Y. **Thin boiling starch.** Treats the starch with very dilute acid while in a free flowing state of suspension, and kept hot as possible without breaking down the starch granules, then neutralizing the acid and drying.

697,042. Heinrich Thron, Frankfort on Main, Germany. Assignor to Vereinigte Chininfabriken Zimmer und Co., same place. **Cinnamic ether of cinchona alkaloids.** A tasteless white powder melting at 111° C., easily soluble in alcohol, ether and benzene, difficultly soluble in water and ligroin, forming salts with inorganic and organic acids.

697,138. Antonin Germot, Asnieres and Henri E. L. Fievet, Paris, France. **Oxidizing metallic sulphides.** Suspends them in a dilute acid and blows a current of ozonized air into the liquid.

697,207. Henriette Herfs, Bonn, Germany. **Water and fat proof paper.** Treating paper at any point in its manufacture with a coat of lac varnish and a coat of talc.

697,234. François Chailly, New York, N. Y. Assignor to Standard Briquette Co. of N. J. **Fuel block.** Mixes comminuted fuel with a binder of dextrin, calcium sulphate and sodium silicate.

Digitized by Google

697,319. Herman E. Brown, Coldwater, Mich. **Making dolomitic sandstone.** Calcines dolomite, hydrates, steams, adds silicious matter comminuted, steams again and treats with carbon dioxide.

697,338. Thomas Harmer, Burlington, N. J. Assignor to Manufactured Rubber Co., Metuchen, N. J. **Utilizing waste rubber.** Mixes refuse rubber and gutta percha with a soft rubber gum as pontianak (Borneo gutta percha), an oil substitute and baryta, grinds and steams under pressure.

697,370. Darius P. Shuler, Sudbury, Canada. **Treating copper-nickel-sulphide ores.** Passes the ore through a magnetic separator to make heading rich in iron and poor in nickel, but containing about the proportion to make nickel-steel, roasting the headings and smelting them with Bessemer iron ore for nickel steel.

APRIL 15, 1902.

697,465. Hans A. Frasch, New York, N. Y. **Caustic alkali.** Absorbs ammonia by a solution of sodium chloride, adds nickel hydroxide, forming caustic soda and nickel-ammonia chloride, separates the latter from the caustic soda, and recovers the ammonia by distillation and the nickel oxide by filtration.

697,544. Walter Rubel, Ludwigsburg, Germany. **Alloy.** Aluminum with 4 to 7 per cent. phosphorus.

697,545. Traugott Sandmeyer, Basle, Switzerland. **Making indigo.** Reacts with hydrogen sulphide on α-isatinanilid to form α-thioisatin, and treats this with an alkaline solution in the presence of hydrogen sulphide.

697,566. John H. Thorn, Puyallup, Wash. Composition for **preserving fruits,** of slaked lime, 20; land plaster, 5; and wheat middlings, 5, mixed and dried.

697,632. Carl Kleinschmidt, Seattle, Wash. Assignor to Emma Maria Kleinschmidt, same place. **Wood preserving compound.** Of copper sulphate, iron sulphate and potassium cyanide, 2 pounds each; sulphuric acid, 4 pounds; prussic acid, a half pound; and refined petroleum, 40 gallons.

697,641. Joseph B. Miller, Richmond, Ind. **Fire extinguishing compound.** Sodium bicarbonate, 25; soda ash, 5; sulphur, 3; lime, 3; salt, 1; sea sand, 4, all in pounds; meal powder and oxalic acid, 8 ounces each; and manganese, 10 ounces.

697,656. Manuel Pereda, Brooklyn, N. Y. **Beverage.** Crushes pineapples and extracts the juice, ferments and distils brandy from a part thereof, then adds to each 100 parts of the juice one-half part brewer's yeast and white sugar each, ferment and strain, then add six parts of the brandy first made and bottle.

697,730. Arthur Liebreich, Frankfort-on-Main, Germany. As-

Digitized by Google

signor to Farbwerke, vorm. Meister Lucius und Bruning, Hochst-on-Main, Germany. **Isovaleramid derivative.** Treats compounds of isovaleric acid with dialkylated amines, the product distils between 205° and 208° C. at 20 mm. pressure, difficultly soluble in water, readily in alcohol and benzene, but less soluble in ether.

697,731. Iens P. Lihme, Cleveland, Ohio. **Making lithopone.** Mixes solutions of zinc sulphate and barium sulphide, adds sodium bisulphate to precipitate lithopone and leaves sodium hydrosulphide in solution.

697,765. Ernst Winter, Hochst-on-Main, Germany. Assignor to Farbwerke, vorm. Meister Lucius und Bruning, same place. **Red cotton dye.** By reacting on 2-5-7-aminonaphtholsulphonic acid with aromatic mustard oils, and combines with diazo compounds. A brown-red powder of metallic luster, soluble in water, the solution turning blue-red on adding acid and yellow-red on adding alkali, little soluble in alcohol, insoluble in petroleum ether, dyeing cotton directly blue-red.

697,774. William T. Armstrong, San Jose, Cal. Apparatus for **assaying ores.** A tubular structure of heat-resisting material, closed by a cap at one end, the other end being perforated, and an ore-containing receptacle to fit in the tube and adapted to carbonize.

697,790. Jean B. G. Bonnaud, Ostend, Belgium. **Pyroxylin compound.** Adds to a pyroxylin solution, a mixture of gum copal in castor oil, with sugar of lead, white copperas, litharge and a little vanillin.

697,831. Hans A. Frasch, Hamilton, Canada. **Recovering metals by electrolysis.** The current acts on a double salt of ammonium and nickel chloride in a tank with a horizontal pervious diaphragm, precipitating metallic nickel on the cathode, forming at the anode chlorides of the various metals as impurities.

697,898. Carl R. P. Steinau, Cleveland, Ohio. **Purifying zinc-bearing ore.** Zinc-bearing solutions containing copper, lead, arsenic, cadmium, etc., are treated with a mixture of zinc powder 75 and zinc oxide 20 parts, to precipitate the above metals, then removing iron and manganese, and adding an alkaline hydroxide and hypochlorite, to remove part of the cobalt and nickel, and finally more zinc powder to complete the purification.

697,931. Henry S. Blackmore, Mt. Vernon, N. Y. **Gas-purifying material.** Pulverizes hematite iron ore, mixes it with calcium oxide and water.

697,957. Albert Y. Werner and Pearis B. Ellis. Assignors to William M. Stewart and Charles J. L. Kappler, all in Carson City, Nev. **Extracting gum from greasewood.** Crushes the plant and steeps in water, drains off the water and steams, ex-

Digitized by Google

presses the liquid, partially concentrates and dissolves out the rubber-like gum by a rubber solvent.

APRIL 22, 1902.

697,976. Volney E. Brown, Woodstock, Ill. Composition for **cleaning metals.** Powdered tripoli, 2; cake tallow, 1¼ pounds; kerosene oil, 15; linseed oil, 8; beeswax, 4; camphor, 3 ounces; and perfumed to suit.

697,994. Maurice Dinesman, Paris, France. Making **thymol.** A mixture of 2-bromo-*p*-cymene, 3- or 5-sulphonic acid, with ammonia and zinc powder, is heated for several hours in a digester at from 100° to 170° C., and the resulting product is heated to 300° C., with an alkaline hydroxide.

698,062. Frederic W. C. Schniewind, New York, N. Y. **Making gas.** Distils carbonaceous material, separates the gas in two portions, extracts the illuminants from one portion and adds them to the other, makes from another portion of carbon water gas by air and steam in the usual way, mixes said water gas with the enriched coal gas, also mixes the producer gas with some of the gas robbed of its illuminants, and uses the mixture to heat the distilling retorts.

698,079. Heinrich Thron, Frankfort-on-Main, Germany. Assignor to Vereinigte Chinen Fabriken, Zimmer and Co., same place. **Salicylate of salicyl quinine.** One molecule of salicylic acid and one molecule of salicylic acid ether of quinine, the product being tasteless white crystals, insoluble in water, ether and ligroin, but readily soluble in benzene, hot alcohol and chloroform.

698,150. Claus A. Spreckels and Charles A. Kern. **Purifying sugar.** Mixes with the sugar to be purified, a sulphonic acid or a supholeaginous derivative of a resinous body and then separating it.

698,163. Charles Wessell, New York, N. Y. **Refining spelter.** Treats the melted spelter with horn, phosphorus and magnesium.

698,184. James F. Duffy, Chicago, Ill. **Refining and aging alcoholic liquors.** Air under pressure is mingled with the liquid, it is heated and then atomized; air is impregnated with tannin or acetic acid and mixed with the atomized heated mixture.

698,207-8-9-10-11. All to Emile Maertens, Providence, R. I. **Cleaning wool.** Extracts the wool fat by a volatile solvent, then removes the bulk of the solvent and wool fat, and adds a reagent as water to remove the remaining wool fat without decomposition, or may use an acid or acid salt, then neutralizes and washes. Numerous modifications of these steps are suggested.

698,220. Anton Pfenniger, Brugg, Switzerland. Assignor to

Digitized by Google

Chemische Fabrik Brugg, A. G. vorm. Zimmermann and Co., Brugg, Switzerland. **Greenish black sulphur dye.** Heats *p*-toluene sulphonate with alkaline sulphides and obtains a greenish black direct dye.

698,254. Emile Bronnert, Niedermorschweiler, and Max Fremery and Johann Urban, Aachen, Germany. Obtaining **cellulose threads.** Expresses the cellulose solution into sulphuric acid of from 30 to 65 per cent.

698,268. Otto Friz, Nuremberg, Germany. Assignor to C. A. Kapforer and Wilhelm Schleuning, Munich, Germany. Making **white cement.** Mixes lime 65, and clay free from iron 14, with feldspar 21 per cent., and burns to the verge of fusing, or beyond the sintering limit.

698,292. Edward D. Kendall, New York, N. Y. **Recovering metals.** A dilute solution of potassium cyanide holding metals dissolved, is run over a mass of carbon fragments of large surface, acting as a cathode, plate of carbon for anodes carrying about five volts, then stopping the flow of dilute solution and starting a strong solution of potassium cyanide over the carbon fragments and reversing the current not exceeding five volts.

698,328. Paul Seidel, Ludwigshafen, Germany. Assignor to Badische Anilin und Soda Fabrik, same place. Making **indigo from indol.** Treats indol with sulphomonoper acid.

698,341. Gerhard N. Vis, Schweitzerhalle, Switzerland, **Treating brine.** Salt free from gypsum is obtained by adding to the brine sodium and ammonium sulphates and slaked lime, passing carbon dioxide through the mixture, separating the precipitate, evaporating the liquor, removing the sodium chloride, and reusing the mother-lye of ammonium sulphate in subsequent operations.

698,345. John W. White, Wisner, Nebr. Composition for **protecting growing plants.** Clay 128, common salt 1, eucalyptus fluid 8, and naphthalene moth balls 24.

698,399. Frank Fuhrmann, Berlin, Germany. Making **magnesium peroxide compound.** Dissolves magnesium chloride, ammonium chloride and sodium peroxide in water, cools, after the reaction, adds alcohol, allows to stand, separates the precipitate, at a low temperature, grinds, washes dries and grinds again.

APRIL 29, 1902.

698,454. Adolfo De Clairmont, Topeka, Kansas. **Filler compound for tires.** Glue, molasses, water and granulated cork one part each, rosin half a part.

698,462. James D. Darling, Philadelphia, Pa. Assignor to Harrison Bros. and Co., same place. **Making alkaline cyanides.** Makes a cyanized charcoal by heating alkaline oxides with carbon

Digitized by Google

and nitrogen, heats this charcoal with ammonia gas and alkali metal whereby the carbon of the charcoal is converted into cyanide.

698,463,-4. Same as above, except that ammonium hydroxide and an alkaline amide may be used.

698,534. Louis A. Morel, Paris, France. **Manufacturing gluten.** Freezes, presses and spreads the gluten on supporting plates, then exposes it to freezing-temperature in a vacuum, finally thaws and dries it.

698,555. Christopher Ris, Basle, Switzerland. Assignor to aniline color and extract works, formerly John R. Geigy, same place. **Green sulphur dye.** Melts the sulphonic acid of dimethyl-*p*-aminophenylquinonimide with alkaline polysulphides in the presence of copper compounds. A dark powder, soluble in water dark violet, scarcely soluble in alcohol, insoluble in ether and benzene, soluble in concentrated sulphuric acid to a blackish brown color turning to a gray-violet shade, and dyeing unmordanted cotton fast green.

698,632. Leon Cerf, Lyons, France. Making **modified starch.** Mixes amylaceous water with persulphates of ammonia, etc., to replace gelatine.

698,694. Arthur Eichengrun and Rudolph Berendes, Elberfeld, Germany. Assignor to Farbenfabriken of Elberfeld Co., New York, N. Y. **Zinc gelatose compound.** A yellowish white powder from gelatose and zinc chloride, soluble in water, dilute alcohol and dilute acetic acid but insoluble in ether, benzene and chloroform.

698,696. Richard Franchot, Niagara Falls, N. Y. Making **paris green.** Passes an electric current through a solution of an acetate and arsenious acid with a copper anode, and the cathode immersed in a solution of an acetate and inclosed to prevent the cathode products mixing with the arsenious acid of the electrolyte.

698,698. Robert E. A. Gans, Pankow, Germany. **Match mixture.** Ignition material of tetrathionic acid and oxygen-yielding material as potassium chlorate.

698,704. Edward Hart, Easton, Pa. Assignor to General Chemical Co., New York City. Making **hydrochloric acid.** A mixture of sodium pyrosulphate, sodium chloride and water are subjected to a temperature gradually increasing from one end to the other of the mass, so that the liberated gas passes over the nearly finished salt cake, the temperature increasing to nearly red heat.

698,739. John Rudolphs and John Landin, Stockholm, Sweden. Assignors to Alwin Jacobi, same place. **Extracting metals** from their oxides. Making briquettes of pulverized

Digitized by Google

oxides, as ores, carbon, hydrocarbon and an organic nitrogen compound as coal or dried blood, molding and heating.

698,741. Eugen Schaal and Max Schaal, Feuerbach, Germany. **Hardening rosin.** Treats powdered rosin with oxygen at a temperature just below melting, then neutralizes the resin acids with any suitable substance, whereby a hard copal-like body is obtained.

698,746. Euge Seel, Stuttgart, Germany. **Aloin derivative.** Assignor to Farbenfabriken, of Elberfeld Co., New York, N. Y. Treats aloin with a persulphate and separates the product, which is a yellow-red powder, nearly insoluble in absolute alcohol, water and acetone, soluble in alkalies and concentrated sulphuric acid.

698,761. Nathaniel Thurlow, Newark, N. J. Assignor to Portchester Chemical Co., of New York. **Making camphor.** Reacts on turpentine, with oxalic acid at about 120° to 130° C., obtaining pinyl formate, then treating the mixture with lime, and distilling to separate the borneol and camphor, and oxidizing the borneol to camphor. The pinyl formate boils at 160° to 163° C., solidifies at —17, decomposes on heating into borneol and carbon monoxide, and on heating with caustic alkali in solution gives a hydrocarbon and a formate.

698,769. James H. Walker, Milwaukee, Wis. **Preventing oxidation of molten metal.** Carries the burning gases of combustion around the crucible without allowing them to come in contact with the metal, then leading the deoxidized air over the crucible.

698,856. Leonard M. Randolph, Newark, N. J. Assignor to Bancroft G. Brains and Lawrence F. Brains, Brooklyn, N. Y. **Plastic compound,** of old rubber 20, powdered peat 25 parts, the residue from varnish making, and sufficient naphtha to dissolve the rubber, mixing, drying and grinding.

698,889. Herbert B. Atha, East Orange, N. J. **Facing molds,** for steel castings. Mixes magnesium carbonate and an inflammable liquid, coats the surface of the mold with the liquid and burns it off.

699,009. Andrew J. Polmeteer, Whitehall, Mont. Assignor to Joseph Mitch and Alberta G. Dygert, Butte, Mont. **Precipitating copper from water.** Before the water enters the pump adds an excess of alkaline solution, as calcium sulphide and calcium hydroxide.

699,012. Ernest Quintaine, Argenteuil, France. **Obtaining tin by electrolysis.** Suspends tin scrap as an anode in a bath of tin nitrate and ammonium and tin chlorides, suspending a suitable cathode in the bath and passing the current.

WM. H. SEAMAN.

Digitized by Google

REVIEW OF AMERICAN CHEMICAL RESEARCH.

VOL. VIII. NO. 11.

WILLIAM A. NOYES, Editor.

REVIEWERS:

M. T. Bogert, E. M. Chamot, B. S. Cushman,
Benton Dales, L. M. Dennis, A. H. Gill,
H. M. Goodwin, W. F. Hillebrand, L. P. Kinnicutt,
H. W. Lawson, H. N. McCoy, A. A. Noyes,
J. W. Richards, S. P. Sadtler, J. O. Schlotterbeck,
W. H. Seaman, F. P. Underhill.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

The Saline Deposits of California. BY GILBERT E. BAILEY. *California State Mining Bureau, Bull. No. 24.* 216 pp.—In this very untechnical report some features of the geology of the Great Basin and of the origin of the deposits are touched upon in Part I, following which in Parts II-V are taken up in detail the borates, carbonates, chlorides, and nitrates. The last are at the present time of special interest, and according to the investigations of the Mining Bureau and others promise to be a source of great wealth to the state. Numerous analyses, derived from a variety of sources, supplement the text. W. F. HILLEBRAND.

Some Principles and Methods of Rock Analysis. BY W. F. HILLEBRAND. *United States Geol. Survey, Bull. No. 176.* 114 pp.—The original edition of this bulletin having been exhausted, it has been reissued under authorization of Congress. Except for a very few minor changes in the text and the insertion of two extra leaves of matter relating to the estimation of silica and the ignition of magnesium pyrophosphate, there are no changes from the earlier edition. This and most professional papers of the Survey are now sent free to applicants. W. F. HILLEBRAND.

Development and Application of Water Near San Bernardino, Colton, and Riverside, Cal. BY J. B. LIPPINCOTT. *U. S. Geol. Survey, Water Supply and Irrigation Papers, Nos. 59 and 60.* 141 pp. This report contains analyses by E. W. Hilgard, of a soil and subsoil at Riverside, and of waters from artesian wells and from Warm Creek, and of Portland cement by E. Duryee, from the works at Colton, the only plant on the Pacific coast. Results of physical tests of this cement are also given and it is said to equal the imported brands. W. F. HILLEBRAND.

Mineral Resources of South Dakota. *South Dakota Geol. Survey, Bull. No. 3.* 136 pp.—The greater part of this bulletin is taken up with the report of C. C. O'Harra on the *Mineral*

Digitized by Google

Wealth of the Black Hills, which first appeared as a bulletin of the South Dakota School of Mines and has already been noticed in this Review (**24**, R. 385). The remainder of the bulletin (pp. 81–130), by James E. Todd, State geologist, is devoted to the "Mineral Building Materials, Fuels, and Waters of South Dakota." The analyses appearing therein are nearly covered by the following statement: Four of Rapid City fire-clays, which seem to be new, four of fullers' earth, eight of waters from Hot Springs and vicinity, and twenty-eight of waters from artesian and other deep wells. None of the artesian waters can be regarded as a first-class drinking-water. W. F. HILLEBRAND.

Meteorite Studies, I. By OLIVER CUMMINGS FARRINGTON. *Publications Field Columbian Museum, Geol. Series*, **1**, 282–315. —Several meteorites in the collection of the Field Columbian Museum, heretofore incompletely or not at all described, have been subjected to careful study. Numerous photographs illustrate the text. The analyses given are by H. W. Nichols, assistant curator. *Long Island, Phillips County, Kansas.*—Most of this meteorite is in the possession of the museum. Its weight as there represented by 4 large and 2,930 small fragments is 1,184 pounds (537 kilos), making it the largest single stone meteorite known. It is traversed by planes resembling joint planes, which are preterrestrial in their origin. It belongs to the crystalline chondrites, and is characterized by the highest yet reported content of chromite. The analysis follows:

	Metallic.	Soluble in hydrochloric acid.	Insoluble.	Total.
SiO_2	...	9.11	26.54	35.65
Al_2O_3	...	1.64	1.44	3.08
FeO	...	17.19	5.66	22.85
MgO	...	8.99	13.75	22.74
CaO	...	0.02	1.38	1.40
Na_2O	...	0.00	0.25	0.25
K_2O	...	0.00	0.03	0.03
H_2O above 100°	...	1.52	...	1.52
TiO_2	...	...	trace	trace
P	...	0.036	0.024	0.060
S	...	1.900	....	1.900
Cr_2O_3	...	0.34	5.99	6.33
NiO	...	0.089	0.68	0.769
CoO	...	0.013	0.047	0.060
MnO	...	trace	...	trace
Fe	2.60	...	. .	2.60
Ni	0.67	...	...	0.67
Co	0.036	...	...	0.036
O for limonite	...	0.90	...	0.90
	3.31	41.75	55.79	100.85
Less O for S	...	0.95	...	0.95
Less O for P	...	0.06	0.04	0.10
	3.31	40.74	55.75	99.80

Digitized by Google

From the above, the following probable mineralogical composition is found: bronzite and monoclinic pyroxenes, 47.05; chrysolite, 24.74; limonite, 10.50; chromite, 8.83; troilite, 5.24; schreibersite, 0.23; nickel-iron, 3.31; oxides of Co and Ni, 0.10. *Ness County, Kansas.*—Descriptive of a small individual, weighing 85 grams, whose relation to the other aërolites from Ness County is discussed. The stone "should probably be classed as a crystalline chondrite or Meunier's erxlebenite, although its chondritic nature is somewhat doubtful." *Toluca (Los Reyes) Mexico, D. F.*—This iron, weighing 43 pounds (19.5 kilos) is reported to have been plowed up at Los Reyes, 40 miles directly east of Toluca. The etched figures show it to belong to Brezina's group 46 or Meunier's group 7. Its chemical composition is not opposed to the view that it may belong with the Toluca irons. Analysis gave: Fe, 90.56; Ni, 7.71; Co, 1.07; Cu, 0.14; Mn, trace; P, 0.24; C, 0.01; S, 0.025; Si, 0.006; Insol., 0.09; total, 99.85. The mineral composition indicated is: nickel-iron, 97.98; schreibersite, 1.55; cohenite, 0.15; troilite, 0.07. *Hopewell Mounds, Ross County, Ohio.*—Among other objects of archaeological interest found in these mounds, was a small unwrought mass weighing about 5 ounces (130 grams). The etched figures show it to be of meteoric origin, but its classification is impossible because of the distortion of the figures, due doubtless to attempts of the aborigines to fashion the mass into an ornament. "Apparently it is an octahedral iron having lamellae of medium width." Analysis gave: Fe, 95.20; Ni, 4.64; Co, 0.404; Cu, 0.035; Mn, trace; Sn, trace; S, 0.13; P, 0.07; total, 100.48. *Taenite from the Kenton County Meteorite.*—In spite of the fact that only 0.022 gram was available for analysis it is believed that the following figures, closely conforming to the formula $Fe_{13}Ni_3$, fairly well represent its composition: Fe, 80.3; Ni and Co, 19.6. The wide range in composition of taenite obtained from different meteorites is not considered strange. "Kamacite, being the substance with the lowest freezing-point, is to be considered the eutectic of the series and as such has a fairly uniform composition, but this would not be expected of the other alloy or alloys." W. F. HILLEBRAND.

The Casas Grandes Meteorite. BY WIRT TASSIN. *Proc. U. S. Nat. Mus.*, **25**, 69–74.—This large lenticular iron, weighing 3,407 pounds, found in the State of Chihuahua, Mexico, and which came into the possession of the Smithsonian Institution in 1876, has been recently studied in some detail. The surface exposed by cutting and then polished, showed a few small scattered nodules and grains of troilite, but no schreibersite, carbonaceous nodules, or stony matter. A beautiful crystalline structure was developed by etching, and the surface then showed "numerous fine lines of a yellowish to tin-white color, which was found to be

Digitized by Google

schreibersite." An analysis of turnings gave : Fe, 95.13 ; Ni, 4.38; Co, 0.27; P, 0.24; Cu and C, traces. These figures correspond to nickeliferous iron, 98.65, and schreibersite, 1.35. Two additional careful tests were made to see whether or not the nickel-cobalt contents were constant. How widely they varied the following figures show :

	a.	*b.*	*c.*
Ni	4.38	5.02	4.50
Co	0.27	0.30	0.00

From them the author draws the conclusions "that a bulk analysis is of little value unless made on the entire mass, or upon a very large sample," and that " mineralogical separations of as large amounts as possible, together with the study of sections, are the safest guide to the composition of a meteoric mass." A nodule of troilite, having a specific gravity of 4.789, afforded : Fe, 63.40 ; Ni, 0.20 ; S, 36.21. The segregation of this sulphide seems to be attended by that of graphite, usually as a very thin layer between the troilite and the iron. No such segregation of phosphide adjacent to the troilite was noticed. A considerable amount of small folia and grains, strongly magnetic, of schreibersite was isolated and analyzed. The specific gravity was 7.123, and the composition : Fe, 64.69 ; Ni, 20.11 ; P, 15.00. Thin taenite lamellae were collected and found to consist of: Fe, 82.90; NiCo, 16.64 ; Cu, 0.04 ; P, 0.09. The carbon was wholly graphitic. No other minerals except traces of a non-polarizing silicate coating some of the schreibersite were observed. Four plates illustrate the text. W. F. HILLEBRAND.

ANALYTICAL CHEMISTRY.

The Solubility of Barium Sulphate in Ferric Chloride, Aluminum Chloride, and Magnesium Chloride. BY G. S. FRAPS. *Am. Chem. J.*, **27**, 288–291.—A comparison of the results obtained by the author on the solubility of barium sulphate in 10 per cent. solutions of ferric chloride and aluminum chloride with those of Fresenius on the solubility of barium sulphate in 10 per cent. solutions of nitric and hydrochloric acids and ammonium chloride shows that the sulphate is less soluble in the ferric and aluminum chlorides than in the acids or ammonium chloride. When barium chloride is present in the solutions, barium sulphate is less soluble in ferric or aluminum chlorides than in a 10 per cent. or 2.5 per cent. solution of ammonium chloride or in 2.5 per cent. solutions of sodium chloride, nitric acid, or hydrochloric acid.

B. S. CUSHMAN.

The Determination of Silicon in Ferro-Silicon. BY GEORGE L. NORRIS. *J. Soc. Chem. Ind.*, **21**, 537.—The decomposition of ferro-silicon by sodium carbonate and the double evaporation

Digitized by Google

which must follow for accurate work require so much time that the author has devised the following rapid method: Half a gram of powdered ferro-silicon is dissolved in a beaker, in a solution of 10 grams of ferric chloride (U. S. P.), 50 cc. of strong hydrochloric acid, and about 0.5 gram of tartaric acid. Solution takes place rapidly and requires little heat. When solution is complete, add 25 cc. of strong hydrochloric acid, boil a few moments, remove from the lamp, dilute with cold water, filter, and wash with hot dilute hydrochloric acid and hot water. The silicon is seldom stained with iron oxide, and filters very easily. The time required for an analysis is about half an hour. B. S. CUSHMAN.

The Determination of Arsenic in Iron and Steel. BY GEORGE L. NORRIS. *J. Soc. Chem. Ind.*, **21**, 393–394.—The following method was suggested to the author by the Odling method for the determination of arsenic in copper: To free the reagents required of all traces of arsenic, 2 grams of powdered zinc are added to a solution of 100 grams of ferric chloride (U. S. P.) in 150 cc. of concentrated hydrochloric acid. After all action ceases, the solution is boiled for about ten minutes. Ten gram samples of iron or steel are dissolved in the purified ferric chloride solution by aid of a gentle heat in a 500 cc. Erlenmeyer flask provided with a separatory funnel and an outlet tube which dips into a beaker containing about 300 cc. of cold distilled water. The outlet tube is arranged to trap and return to the flask nearly all of the ferric chloride and hydrochloric acid that distils over. After the sample is completely decomposed the solution is boiled for about fifteen minutes. The arsenious chloride is precipitated as fast as it is distilled either by leading hydrogen sulphide into the beaker of water or by adding zinc sulphide before beginning the determination. The arsenic may be estimated by any of the usual methods. B. S. CUSHMAN.

A Photo-Micrographic Device. BY FREDERICK E. IVES. *J. Frank. Inst.*, **153**, 371.—A simple, inexpensive, and easily constructed camera attachment for the microscope is described, which can be almost instantly attached to a microscope in any position, requiring no refocussing or special adjustment and which will give a photograph of the same magnification as that of the microscope. The apparatus consists of a light tight wooden box of fixed length. At one end is mounted a lens of 10-inch focus; the other end, 10 inches away, carries the plate-holder for 4 x 5 plates. This camera box is mounted upon an inclinable bed and is moved by rack and pinion. In operation, the microscope is focused for most distinct vision, then without touching or refocussing, the camera is attached by simply sliding its base in place, the 10-inch lens is made to occupy the position of the eye at the eye-point of the microscope and the exposure made. Accord-

Digitized by Google

ing to the author the attachment and adjustment of the camera requires only twenty to thirty seconds. The photographs obtained are reproductions of the images just as seen by the eye in the microscope and are equal in quality to any that are made by the most elaborate and expensive apparatus. Cuts showing the construction of the device accompany the article.

E. M. CHAMOT.

METALLURGICAL CHEMISTRY AND ASSAYING.

Mines and Metallurgy Building at the St. Louis Exposition. *Eng. Min. J.*, July 12, 1902.—Illustrated description of the fine building, 525 by 570 feet, having 400,000 square feet of floor space. Prof. J. A. Holmes, State geologist of North Carolina, is chief of the department. J. W. RICHARDS.

The Structure of Metals and Binary Metals. BY W. CAMPBELL. *J. Frank. Inst.*, July and August, 1902. A clear presentation of the subject of practical metallography and some of its results, explaining the preparation of the sample, cutting and polishing the surface, etching, mounting the specimen, and microphotography, describing particularly the methods taught by Roberts-Austen and Sauveur. The discussion of the crystalline structure of metals contains interesting facts, especially the changes brought about by strain. A large number of beautiful photomicrographs give additional interest to the paper. The discussion of alloys is largely a review of Dr. Mathew's recent papers on this subject. J. W. RICHARDS.

The Dry Crushing of Ore. BY P. ARGALL. *Eng. Min. J.*, July 5 and 12, 1902. Although there is no chemistry in this article, yet its perusal can be recommended to all chemists or metallurgists having to crush or sample ore or other like material.

J. W. RICHARDS.

The Nomenclature of Metallography. *Metallographist*, April, 1902.—A glossary of terms used in metallography, with explanations, which will be of considerable use to students of the subject. This is a provisional list prepared to bring out criticism and thus to aid the committee of the Iron and Steel Institute in their work of revising the nomenclature of the subject. Suggestions of corrections or new terms are earnestly invited by the committee.

J. W. RICHARDS.

Mineral Production of the United States in 1901. *Eng. Min. J.*, Aug. 16, 1902.—A summary from the annual report of the U. S. Geological Survey, of the metals and minerals produced, the metals having a value of $524,873,284, the non-metallic substances $566,351,096, unspecified $1,000,000, total $1,092,224,

Digitized by Google

380. The order of value of the metals is pig iron $242,174,000, copper $86,629,266, gold $80,218,800, silver $77,126,382, lead $23,280,200, zinc $11,265,760, aluminum $2,238,000, mercury $1,382,305, antimony $542,020, platinum $13,000, nickel $3,551.
J. W. RICHARDS.

Pig Iron Production in 1902. *Eng. Min. J.*, August 2, 1902. —Statistics from every maker of pig-iron in the United States, show that during the first half of 1902, 8,808,574 tons were produced, as against 7,674,613 tons the first half of 1901, and 8,203,741 tons the second half of 1901. This is a uniform increase of 7.5 per cent. each half year. J. W. RICHARDS.

Our Copper Supply. *Eng. Min. J.*, August 23, 1902.—The copper supply of the world in 1900 was 546,552 tons, of which the United States produced 289,759 tons. The Canadian and Mexican outputs of copper are sent to the United States to be refined, and since they are both increasing very rapidly, our total output of refined copper is now nearly 350,000 tons.
J. W. RICHARDS.

Production of Zinc in 1901. *Eng. Min. J.*, August 2, 1902.—Mr. Charles Kirchoff has compiled the production in the United States as 140,822 short tons, an increase of 16,936 tons over 1900. The world's production is estimated at 501,494 long tons. The Lanyon Zinc Company, of Kansas, is the second largest producer in the world. Zinc-white fell off 8,262 tons from the production of 47,151 tons in 1900. J. W. RICHARDS.

Production of Coke in 1901. *Iron Age*, July 24, 1902.—The output was 21,495,883 short tons, valued at $44,445,923. Interesting details are given concerning the extent and location of the industry. The average weight of coal used is 1.57 tons per ton of coke. By-product ovens produced 1,179,900 tons, from 1,165 ovens. Details regarding the distribution and working of these ovens are given. J. W. RICHARDS.

Mineral Production of California for 1901. *Eng. Min. J.*, August 9, 1901.—Summary of an interesting report of State Mineralogist Aubury. The total value of metals was $25,052,796, an increase of $6,694,066. The order of values of the principal items is gold, copper, petroleum, mercury, silver, borax. Details are given for the various products, and for all the counties of the State. J. W. RICHARDS.

Production of Bauxite and Aluminum in 1901. *Al. World*, June, 1902. (From bulletin of the U. S. Geological Survey, by J. Struthers.)—The production for 1901 is given as the same as 1900; *viz.*, 7,150,000 pounds, a daily average of 19,600 pounds. This is all manufactured at the two plants of the Pittsburg Re-

Digitized by Google

duction Company, at Niagara, by the use of 10,500 horse-power, giving an average of 1.86 pounds output per horse-power day. The year 1903 will see a considerable increase, owing to the establishment of a 12,000 horse-power plant by the same company, at Massena, N. Y. The production of bauxite was 18,905 long tons. A very large mine is being opened at Bauxite, Ark., which will considerably increase this total in 1902. An equal quantity of French bauxite was imported. J. W. RICHARDS.

United States Mineral Exports. *Eng. Min. J.*, Aug. 9, 1902. —A summary of exports of minerals, metals, and heavy chemicals during the first half of 1902. There were, as compared with the first half of 1901, large decreases in copper sulphate, anthracite coal, scientific instruments, steel rails, steel ingots, machinery, lubricating oils, paraffin, nickel, and pigments ; there were large increases in copper ingots, iron wire, hardware, and steam engines. The sum total was $132,610,465, a decrease of $875,410. J. W. RICHARDS.

A New Molding Process. *Iron Age*, July 24, 1902.—Describes a new method invented by F. Baldt, Sr., of the Penn Steel Casting Works, Chester, consisting in first making a master mould from the original pattern, then casting in it numerous fusible patterns. The fusible pattern is put into an iron flask, which is then filled with sand by compressed air. The box is run into the drying oven, where the fusible pattern is melted out, and the casting is then made in the dried mold. The process largely dispenses with skilled labor, and the castings are seamless and without fins ; it is particularly applicable to casting chains and similar interlocked articles. J. W. RICHARDS.

The British Iron Trade Commission. *Iron Age*, July 3, 1902. —A review of the report of the commission's visit to the United States, which is a 583-page volume of detailed accounts of American iron and steel practice and methods. J. S. Jeans, secretary of the British Iron Trade Association, reports on the general economic and industrial conditions, A Sahlin on blast-furnace practice, E. Parkes on sheet and bar mill practice. Beside the technical details, the report has numerous allusions to the purely human side of the inquiry, and is, altogether, an exceptional document well worthy of perusal. J. W. RICHARDS.

The Proper Valuation of Pig Iron for Foundry Purposes. *Iron Age*, July 3, 1902.—A collection of communications criticizing the memorial of Dr. Moldenke on this subject, recently published (*Iron Age*, June 26, 1902). The concensus of opinion is that the suggestions are either impracticable of fulfilment or fundamentally wrong. J. W. RICHARDS.

Digitized by Google

Recording and Interpreting Foundry Costs. By P. LANGMUIR. *Eng. Mag.*, Sept., 1902.—The plan of dividing total labor cost by total output can yield only an average labor cost factor, and is unsatisfactory where castings are made of varying size and shape and in varying ways. A more detailed analysis of costs should be adopted, so as to indicate the cost of various classes of molding. The cost sheet should show the labor cost for each class of work, the weight of each produced, and the cost of molding and labor per hundredweight, for each class. Graphic representations of these can then be plotted, and the working of the foundry in all classes of goods is evident at a glance. On this cost chart is placed a "good working" line, a "caution line," and a "danger" line, which will serve to stimulate the closest attention to details of cost and profit.

J. W. RICHARDS.

Chains and Their Manufacture. *Iron Age*, July 3, 1902.—A long, well-illustrated article describing the manufacture of different kinds of chains, cast and welded, the strength of different forms and the uses to which they are most suitable. An article interesting to all metal workers. J. W. RICHARDS.

Accuracy and Value in the Testing of Cast Iron. By R. MOLDENKE. *Eng. Mag.*, August, 1902.—The true way to test castings is to test "to destruction." Only a small proportion can be thus tested, by far the greater part must be otherwise tested, because of their size and value. With these, the best way is to test the iron itself under standard conditions, apart from the casting, and then to make the casting in the best possible way. The manufacturer can invite the purchaser, or his inspector, to visit his foundry, supervise the making and testing of the test-bars, and observe all the work of casting, to see that it is properly carried out. J. W. RICHARDS.

A Queer Phenomenon in Melting. By G. P. BLAKISTON. *Iron Age*, July 24, 1902.—Calls attention to the fact that pieces of wrought-iron or steel put into crucibles or open-hearth furnaces melt at first *inside*, leaving a skin which melts afterwards. The explanation is that the oxide on the surface, formed during hammering or rolling, reinforced by the oxide produced by the action of the flame, gives the surface a higher melting-point, and as the central part cannot get oxidized to the same degree its melting-point is not raised and it naturally melts first, forcing its way out through the outer skin. Two photographs illustrate the phenomenon. J. W. RICHARDS.

The Structure of Steel Rails. By S. S. MARTIN. *Metallographist*, July, 1902.—A comparison was made of the micro-structure of the end of a rail which had been hot-sawed and one cold-

Digitized by Google

sawed. The hot-sawed end gave a much finer grain, because of the disturbance to crystallization while cooling. Attention is thus called to the benefit of working while hot and of a low finishing temperature ; also to the importance of taking a cold-sawed section for microscopical examination, in order to learn the true character of the rail. J. W. RICHARDS.

The Manufacture of Soft-Center Steel. BY G. P. BLAKISTON. *Iron Age*, July 31, 1902.—Discusses the casting of high-carbon steel, 1.30 to 1.50 per cent., around a plate of soft iron or low-carbon steel with carbon below 0.10 and phosphorus below 0.03. The soft plate is usually one inch thick, is placed in the center of the mould and the steel poured around it. The best way to avoid cracks during cooling is to put the hot ingot into a soaking-pit, to let it anneal slowly. In working down, care should be taken that the ingots are heated slowly and thoroughly. The sheets are laid on coke fires, the pattern marked on them, and then cut while hot. If sheared cold, the hard steel will separate from the soft interior. The plates are particularly useful for plough-shares. J. W. RICHARDS.

The Selection of Steel for Various Articles. *Iron Age*, July 10, 1902.—An alphabetical list of about 250 articles, giving for each, when made of *crucible steel*, the approximate percentage of carbon which it should contain and the temper which should be given it. An original and instructive table. J. W. RICHARDS.

Nickel Steel for Engine Forgings. BY R. S. TAPPENDEN. *Iron Age*, July 17, 1902.—Predicts much larger use of this steel in our merchant marine. One of its greatest advantages is that a fracture, when once started, is not nearly so apt to increase in size as in common steel or wrought-iron, owing to the great tenacity of the metal. The elastic limit is very much higher than that of ordinary carbon steel of the same tensile strength. The U. S. Bureau of Steam Engineering specifies tensile strength 95,000, elastic limit 65,000, elongation 21 per cent. in 2 inches. These specifications are often exceeded, some tests from steel made at the Fore River Ship and Engine Company's works running as high as 110,000 tensile strength, 74,400 elastic limit, and the required elongation. J. W. RICHARDS.

Some New Roasting Furnaces. *Eng. Min. J.*, Aug. 16, 1902.—A description of furnaces patented recently in the United States, *viz.*, those of Argall, Cappean, Carmichael, Hall, Holtman, Lorenz, Merton, Wedge, Wetherill, and Wright. That of Argall is especially commended. J. W. RICHARDS.

The Metallurgy of the Cupola. BY H. E. FIELD. *Age of Steel*, July 5, 1902. (Read before Am. Foundrymen's Ass'n.).—

Digitized by Google

The best of pig iron can be changed into inferior cast iron by poor melting, while an inferior pig iron may, by judicious melting and mixing, be used in high-grade castings. For every variation in cupola arrangement, there is a variation of the effect in melting iron. Two firms engaged in exactly the same line of work and using the same iron and coke, very often get different results. The percentage of loss or gain of the metalloids or impurities in the iron varies with the height of the tuyeres, size of bed, melting ratio, the size of the tuyeres, pressure of blast, amount of flux, the method of fluxing, and the nature and quality of the fuel. *Sulphur.*—Under ordinary conditions, iron melting in a cupola takes up sulphur from the fuel, in amount proportional to the composition of the coke and iron, the temperature of the iron, and the kind and quantity of flux used. The greater the amount of manganese in the iron the less sulphur will it absorb. *Silicon.*—Iron always loses silicon in passing through a cupola, in amount depending on the composition of the iron and the amount of oxidation during melting. The loss may run up to one-fifth of all the silicon present, in an iron carrying 4 per cent. *Phosphorus.*—This remains practically constant, although sometimes very slightly increased by phosphorus in the fuel. *Manganese.*—There is loss of manganese in melting, since it acts as a protector to the iron. The amount lost depends on the amount of blast used and the percentage of sulphur in the fuel, which latter takes it off as sulphide in the slag. *Carbon.*—Some say that iron loses carbon in remelting, others say that it gains. Tests and analyses have been given to prove both positions. In West's experiments, the iron gained carbon, but it was iron with less than one per cent. of silicon ; in Keep's experiments carbon was lost, but his iron ran high in silicon. Whether carbon will be gained or lost depends on the original composition of the iron and upon the conditions and methods of melting. The hotter the iron, the larger the amount of fuel and the longer the iron stays in contact with it, the more carbon it will gain ; the heavier the blast, the smaller the amount of fuel and the quicker the iron runs out of the cupola, the more carbon it will lose. Melting slow with low blast and a high percentage of coke will cause a gain in carbon ; melting fast with heavy blast and a low percentage of coke, will cause a loss of carbon. An iron originally high in carbon is more likely to lose carbon, and *vice versa*. This is modified by the silicon present. A low carbon and low silicon iron will gain in carbon, but a high carbon and low silicon iron will gain also. Iron in the melted state may be thought of as a solution in which carbon and silicon each reduces the power of the iron to dissolve the other. For stove-plate, and like work, and light and medium machinery castings, the lower down the tuyeres are placed, with a small bed of fuel

Digitized by Google

below, the better the results. For heavy machine castings a large bed has an advantage, with the tuyeres placed high, since the deep hearth makes it practicable to tap heavy runs, and the sulphur absorbed is less detrimental to this class of work. For extra strong iron, low tuyeres are essential and the iron must be removed as fast as melted, using the double spout to facilitate changing ladles. J. W. RICHARDS.

Steel Rails: Relations between Structure and Durability. BY R. JOB. *J. Frank. Inst.*, July, August, 1902.—Has found the following general characteristics of rails which failed in service: (*a*) Coarse, regular granular structure, (*b*) excess of foreign matter, such as oxides, slag, and enclosed gas. Either characteristic resulted in relatively poor service. On the other hand, the rails of the same general composition which give satisfactory service are characterized by (*c*) a generally fine, interlocking, broken up granular form, and (*d*) relative freedom from foreign matter and gas. During five years he found an average of 15 fractures of fine-grained material to one of relatively finer grained, and in each case of the latter, the fracture was due to pipes in the steel, defective cropping. In the manufacture, coarse grain comes from slow cooling from a temperature above the recalescent point. Finishing at a certain lower temperature makes a finer structure all through only when the initial temperature of beginning rolling was not too high. If started at a high temperature and held before the last few passes, the result is a fine grain for $\frac{1}{8}$ to $\frac{1}{4}$ inch from the surface, and a soft, large grain below. "Flowing over" of rails is independent of the composition, and due to unwelded seams produced by gas or foreign matter in the steel. The drop-test does not ensure against some of these defects, as laminated steel may give a good drop-test and yet not be well welded and wear very badly. Solidity and continuity are quite as important as a good microstructure. The most durable rail must show (1) freedom from brittleness, (2) absence of unsoundness, (3) fine granular structure. These are attainable, given steel of proper composition, by a moderately low initial temperature of beginning rolling, sufficient work to render the steel solid, the speed of train and extent of reduction being such that with rapid rolling—without undue holding before or in the last passes, and without artificial cooling subsequently,—the distance between hot saws shall not exceed a specified amount. J. W. RICHARDS.

A New Departure in Manganese Mining. BY J. S. C. WELLS. *Eng. Min. J.*, August 2, 1902.—In the old Crimora Mine, in Virginia, the ore occurs in nodules interspersed in clay. It was formerly worked by tunnels. It is now worked hydraulically, a 2-inch stream under a head of 250 feet carrying off the clay and washing the ore into a basin below the workings. All the ore is thus saved, and washed at the same time. J. W. RICHARDS.

Digitized by Google

Magnetic Separation of Zinc Blende at Denver, Col. *Eng. Min. J.*, August 16, 1902.—The Colorado Zinc Company is treating ore from Leadville, at South Denver, by Wetherill machines. The ore is rolled to 30-mesh, separated on Wilfley tables into galena-pyrites and pyrites-blende classes, and the latter dried and passed over the separators. The blende produced carries about 50 per cent. zinc, 10 to 12 iron, and 1 of lead; the pyrites contains some lead and 5 to 7 per cent. zinc. This latter product is mixed with the galena-pyrites, and sold to the lead smelters. It is the ferrous sulphide in the blende which makes it magnetic. The mill can treat 40 to 45 tons of crude ore daily.

J. W. RICHARDS.

Recent Developments in Southern Copper Deposits. By W. H. WEED. *Eng. Min. J.*, July 19, 1902.—In the Ducktown district, Tennessee, the Tennessee Copper Co. has spent $3,000,000 on its plant and properties, and the Ducktown Sulphur, Copper and Iron Co. $1,000,000. These two companies employ 3,000 men, and the prospects are good for a new lease of life of these old mines. The estimated cost of copper is 9 and 10 cents to the respective companies. In the Virgilina, Va., copper belt, the lack of railway facilities has retarded their development, but now conditions are better and fourteen mines are operating within a radius of eight miles, supplying 17,000 tons of ore in 1901. The Gold Hill district in North Carolina has developed greatly in the last two years, the Union Copper Co. being equipped with a 250-ton plant. The veins are broad and persist as far down as explored, 800 feet. J. W. RICHARDS.

Phosphor Bronze for Hydraulic Castings. By E. S. SPERRY. *Al. World*, April, 1902.—Recommends for a tough alloy for sand castings: copper, 90, tin, $9^{3}/_{4}$, phosphorus, $^{1}/_{4}$; for a hard alloy for sand castings: copper, $87^{1}/_{2}$, tin, $12^{1}/_{4}$, phosphorus, $^{1}/_{4}$. Zinc and lead should not be introduced. If over 12 per cent. of tin is used, the phosphorus should be decreased. The copper is first melted under a good layer of charcoal, and not allowed to get too hot, then add the tin and lastly the phosphor tin, and stir with a plumbago stirrer. When casting, oxide and dross must be most carefully kept out of the mould; the metal should not be cast too hot, as that favors crystallization; it should not be allowed to remain too long in the fire; and too much phosphorus must not be used—one-quarter per cent. is sufficient. If a casting only leaks slightly, under pressure, it may sometimes be stopped by drying out the water and soaking in melted paraffin.

J. W. RICHARDS.

A Method of Phosphorizing Metals. By E. S. SPERRY. *Al. World*, May, 1902.—The yellow phosphorus is used, being cheaper. Under ordinary conditions, the sticks are dried and

Digitized by Google

then immersed in the metal; probably only a fraction of the phosphorus gets into the alloy. The handling is dangerous, it cannot be touched by the hands, and its vapor is poisonous. Most of these difficulties may be overcome by copper-plating the sticks by simply allowing them to stand in a *cold* solution of copper sulphate, one pound of crystals to a gallon of water. Move them about from time to time, and in about an hour they will have plated themselves thickly with copper. Remove carefully and dry completely with sawdust or absorbent paper, and allow them to stand in the air some time to become completely dry. The phosphorus may then be inserted into the metal by using tongs or a plumbago phosphorizer. J. W. RICHARDS.

A New Treatment of Slimes from Cyaniding Talcose Ores. BY M. D. STACKPOLE. *Eng. Min. J.*, July 12, 1902.—The process is worked at Sunshine, Utah. The ore is a mixture of talc and clay, with a small amount of limestone and chert, which, when crushed to a quarter-inch mesh, gives 60 per cent. of slimes. The slimes are impervious to water, and must be separated from the sands for treatment. They are separated by using Moore's copper-ore leaching machine, a truncated cone revolving on a horizontal axis, containing iron balls, the ore being fed in at the upper, small end, and the cyanide solution fed in continuously at the lower end. The sands are discharged from the lower end by a series of buckets, while the slimes are carried out at the upper end by the cyanide solution. By making the separator sufficiently long, all the gold can be dissolved from the slimes before they leave the machine, but in practice they are run into agitating vats, and stirred for an hour, then filtered through presses. The liquor runs to extractor boxes. The coarse sands from the separator pass to percolating tanks, where they are treated seventy-two hours. The percentage of extraction on about $10 ore is 95 per cent of the value.

J. W. RICHARDS.

Notes on the Republic District Washington. BY J. C. RALSTON. *Eng. Min. J.*, July 19, 1902.—The ore is essentially gold ore, running $12 to $16 per ton. The cost of freight and working is at present $10 per ton, but it is being rapidly reduced. The ores run 90 per cent. silica, with a little calcium carbonate, sulphur rarely above 1 per cent., copper, lead, zinc, arsenic, and antimony sometimes present in small amount. They need very fine crushing to 100 mesh, in order to dissolve the gold in cyanide solution. They leach better after roasting. The Republic mill cyanides 200 tons daily. The cyanide consumption is 1.18 pounds per ton of ore. The gold extraction is 91.3 per cent., of silver only 11 to 25 per cent., but the total value of silver is only a few cents per ton. Zinc dust is used for precipitation, using

Digitized by Google

0.95 pound per ton of ore treated. Zinc shavings are preferable when the solution contains copper. J. W. RICHARDS.

Gold and Silver in Shales from Western Kansas. By W. LINDGREN. *Eng. Min. J.*, July 26, 1902.—It has been asserted that gold and silver occur in considerable amount in these shales, and many companies have been floated to work them, and several mills erected, but none have paid. The director of the U. S. Geological Survey had careful assays made which showed the shales to contain from nothing up to 11 cents per ton. The finding of the small amounts was a difficult piece of assay work. The net result of the investigation was that none of the shales are possible paying ores. J. W. RICHARDS.

The Silver Mine of Texas. By H. M. ATKINSON. *Eng. Min. J.*, August 2, 1902.—An illustrated description of the Presido mine, at Shafter. The ore is argentiferous galena, in pockets in limestone. Some twenty miles of drifts have been made, and 300,000 tons of ore taken out. It is hauled one mile to the Cibolo mill, where it is crushed and amalgamated by the Boss modification of the Washoe process. The mill treats 62 tons of ore daily, the milling process requires six hours and the average savings are over 85 per cent. J. W. RICHARDS.

The Gold Sands of Cape Nome. By A. L. QUENEAU. *Eng. Mag.*, July, 1902.—Illustrated description of the author's visit, when attached to the topographical party engaged in mapping about 5,000 square miles of Alaskan territory. The geology of the region is metamorphic, schistose rock prevailing, with gneiss and mica schists passing one into the other. Gold is finely disseminated in these schists, but owing to the rapid rate of erosion it has been quite easily collected in satisfactory quantities. In Anvil Creek platinum and iridosmine have been found; in Sinroch Valley small amounts of native bismuth. The schists and gneiss carry large amounts of small red garnets and magnetite. Veins are rare. The violent waves of Behring sea sort this disintegrated rock, and deposit layers of the various ingredients on the beach. Generally, two men work together at a rocker, one digging, the other washing. Sluicing requires several men. The boxes are 12 feet long, resting on trestles 6 to 8 inches high. Two to four men shovel the dirt. Gasoline engines are used to pump water from the sea. As there is no darkness during the summer months the work goes on continuously, cleaning up every twenty-four hours. Amalgamated plates are in general use but the losses are large, owing to the large proportion of flour gold. The output of Cape Nome has been $10,000 in 1898, $2,000,000 in 1899 (of which $900,000 was from the beach), $5,125,000 in 1900 (of which $1,250,000 came from the beach). The future success of the region lies in hydraulic mining, when

Digitized by Google

the now rich creek diggings have been worked out. Most of the beach gold has been already extracted, litigations which tied up the richest diggings having been settled, and a bright future for the region may be expected. J. W. RICHARDS.

Glacial Gold in Wisconsin. BY K. THOMAS. *Eng. Min. J.*, August 23, 1902.—At St. Croix Falls on the bed of the St. Croix river, the river goes through a gorge at right angles to the Keweenawan trap ridges, and a considerable basin evidently existed above these before the river cut its way through. On the bottom of this basin is a sandy shale, above which is 10 to 25 feet of glacial drift, and at the contact of the two, gold is found as "colors." From this the gold has been washed down into the river bed and concentrated in cracks, crevices and pockets. The amounts hardly pay for working. J. W. RICHARDS.

A Proposed New Assay Ton. BY L. JANIN, JR. *Eng. Min. J.*, July 26, 1902—Since all gold values in ounces are at once converted into money value by multiplying by $20.67, it is proposed to use an assay ton of 30.143 grams, instead of 29.166, and then every milligram of gold obtained represents $20 of value, and the value could be determined from the weights with only a simple multiplication by 20. J. W. RICHARDS.

BIOLOGICAL CHEMISTRY.

The Inactivity of Lipase towards the Salts of Certain Acid Ethers Considered in the Light of the Theory of Electrolytic Dissociation. BY J. H. KASTLE. *Am. Chem. J.*, 27, 481–487.—Lipase is inactive towards the salts of acid ethers, the following having been tested with the ferment: Sodium ethyl succinate, potassium ethyl oxalate, barium ethyl sulphate, potassium ethyl sulphate, barium ethyl phthalate, potassium ethyl phthalate, barium ethyl *p*-sulphobenzoate, sodium ethyl fumarate, barium ethyl *p*-nitrosulphobenzoate, and potassium ethyl *p*-nitrosulphobenzoate. Not one of these compounds was hydrolyzed by the ferment. Lipase has been found capable of hydrolyzing chemically indifferent derivatives of certain of the monoethyl ethers, such as ethyl oxamate and ethyl *p*-sulphaminebenzoate. The inactivity of lipase towards the salts of acid ethers is connected with the electrolytic dissociation of these substances in aqueous solutions, and upon the assumption that the hydrolysis of a substance by means of a ferment is always preceded by the combination of the hydrolyte and the enzyme, the results above described may be construed to mean that lipase cannot form combinations with ions but only with molecules. By far the greater number of substances capable of being hydrolyzed by enzymes are, from the standpoint of the theory of electrolytic dissociation,

Digitized by Google

indifferent or non-ionizable substances. Only a few substances of salt type can be hydrolyzed by ferments. Such substances are potassium myronate and ammonium hippurate.

F. P. UNDERHILL.

On the Quantitative Determination of Acid Albumin in Digestive Mixtures. BY P. B. HAWK AND WILLIAM J. GIES. *Am. J. Physiol.*, 7, 460–492.—It is concluded from these experiments that acid albumin may be almost completely precipitated from acid digestive mixtures at ordinary temperatures by careful neutralization. The later stages in the neutralization process should be conducted with particularly dilute alkali. The absolute quantity of acid albumin remaining in such fluids after neutralization is small, its proportion to the main bulk of the albuminate depending largely on the amount of the latter, also on the volume of the fluid containing it and on the percentage of associated saline matter. Some of this residual portion of acid albumin may be obtained on boiling, although in this process the larger part, sometimes all, is retained permanently in solution, apparently because of its hydration into non-coagulable forms. Proteoses and peptones, even when admixed in comparatively large proportion, do not materially affect the quantitative separation of the albuminate. Neutralization at the boiling-point does not insure the greatest quantitative precipitation of albuminate because of the increased hydration thereby resulting. The largest yield is obtained by neutralizing in the cold, heating the neutral filtrate and combining the two precipitates. Acid albumin, particularly that formed through the action of pepsin on fibrin and in the freshly precipitated condition, is somewhat soluble in various saline fluids. The sodium and potassium salts formed on neutralizing various common acid solutions appear to exert approximately equal quantitative solvent action on the contained albuminate. Only insignificant differences in solvent power were noted. Such quantities of carbon dioxide as are present in fluids neutralized with freshly prepared solutions of potassium or sodium hydroxides containing ordinary minute amounts of carbonate, do not appear to materially affect the quantitative separation of acid albumin by the neutralization process.

F. P. UNDERHILL.

The Nucleoproteid of the Suprarenal Gland. BY WALTER JONES AND G. H. WHIPPLE. *Am. J. Physiol.*, 7, 423–435.—The nucleoproteid of the suprarenal is a thymonucleoproteid, and probably not a nucleohistone. The nucleoproteids of the suprarenal of the beef and the sheep are identical and scarcely differ in chemical composition from the nucleoproteid of the pancreas. The nucleoproteids of the pancreas and the suprarenal gland yield guanine and adenine in the same relative proportions. In

Digitized by Google

so far as these quantitative relations have value, they are in support of Schmiedeberg's contention, that one molecule of a nucleoproteid (or a nucleic acid) may yield two different xanthine bases. Xanthine, hypoxanthine and epiguanine were not found, and it is certain that these bases, if formed at all, can be demonstrated only by the use of extremely large quantities of the nucleoproteid. As Okerblom professed to find hypoxanthine, epiguanine and an excessive amount of xanthine, while he failed to obtain any trace of guanine, one is confronted by a most curious and interesting qualitative difference between the xanthine bases which are performed in the gland and those which result from the hydrolysis of the nucleoproteid. F. P. UNDERHILL.

Physiology of the Pancreas. By RUSSELL H. CHITTENDEN. *N. Y. Med. News*, Aug. 9, 1902.—Being a review of old and recent literature on the subject, and of the various theories advanced. F. P. UNDERHILL.

On the Influence of Different Chemical Compounds upon the Activity of the Diastatic Pancreatic Ferment. By M. WACKSMANN, Contributed by P. Grützner. *Pflüger's Archiv.*, 91, 195–208.—The enzyme employed in these experiments was obtained by extracting the pancreas with glycerol. A sodium chloride content of $^1/_{32}$–$^1/_8$ normal is favorable to the action of the ferment, and is proportionately more favorable the more ferment there is in activity for with the employment of 0.05 and 0.1 cc. of extract the ferment activity is about doubled and with the employment of 0.2 cc. extract the activity of the ferment is tripled. If the salt solutions are concentrated the favorable influence is decreased, although even normal salt solution has a slight favorable influence on the activity of the ferment. Stronger solutions inhibit the activity of the ferment. Sodium bromide behaves in a manner similar to sodium chloride, except that its action is somewhat less favorable to the activity of the ferment. Sodium iodide is even less favorable than sodium bromide. Experiments with alkalies and alkaline salts show that even the smallest traces of these compounds have an inhibitory action on the diastatic ferment. Sodium sulphate and magnesium sulphate, even in the smallest traces, inhibit the action of the ferment. $^1/_{1400}$ normal solution of these salts completely inhibits with 0.1 cc. of the ferment solution added to 10 cc. of 1 per cent. starch paste. Free sulphuric acid, like other acids, accelerates the activity of the ferment; corrosive sublimate is a specific poison for the ferment. Hydrochloric, nitric, acetic, oxalic, etc., acids act upon the ferment in a favorable manner. The hydrochloric acid acts best, and under the most favorable conditions yields four to five times as much sugar as can be obtained from the ferment acting alone. Concentrations of $^1/_{1600}$ to $^1/_{800}$ normal solutions are the most favorable. The stronger the acid

Digitized by Google

solution the weaker is its favorable action. Sulphuric acid is less favorable than nitric acid. Of the organic acids, oxalic acid is less favorable than acetic acid and inhibits much sooner than the latter. Alcohol has no favorable influence, and chloroform has even less than alcohol. Ether and thymol are more favorable, but still inhibit a little. Finally, experiments were carried out with glycerol extracts of the pancreas of different animals. In general they showed that of those animals which possess a diastatic ferment in the pancreas that of the pig was most active. Then followed the rat, rabbit, calf, and the sheep in the order given.

F. P. UNDERHILL.

On the Intermediary Circulation of the Bile Acids. BY ALFRED C. CROFTON. *Pflüger's Archiv.*, **90**, 635–640.—Bile acids are present in the normal blood of the calf. The method for their detection is as follows: 100 cc. of blood, drawn from a canula inserted into the external jugular vein of the calf, are treated with one liter of absolute alcohol, thoroughly shaken, and filtered. The residue is extracted several times with absolute alcohol. The extracts are united and brought to a small volume by distilling off the alcohol. In this concentrated volume the bile acids may be detected by means of Pettenkofer's furfural reaction. By a still further process, the details of which cannot be given here, the bile acids may be obtained in a crystalline form. The bile acids are not present in the blood serum, but are found in the corpuscles. In order to determine whether the bile acids were present in the red or white corpuscles, the following method was employed: Two double ligatures, about four inches apart, were bound around the external jugular vein of a cow, and the portion between the two ligatures excised. This piece of blood vessel was suspended vertically at low temperature in order to prevent coagulation and to allow the red corpuscles to settle out. In this manner it is possible to obtain red corpuscles free from the leucocytes. The red corpuscles contain no bile acids. Therefore, since these acids are contained in blood, and since they are present neither in the serum nor in the red corpuscles they must be present in the leucocytes. What may be the significance of the presence of these bile acids in normal blood cannot be positively stated, but it may be remembered that bile acids in very small quantities, such as are present in the blood, may have the following action *in vitro:* (1) they act cytolytically, particularly for the red corpuscles; (2) act as cholagogues; (3) accelerate blood coagulation; (4) act as vaso-dilators.

F. P. UNDERHILL.

Gastric Acidity. BY L. H. WATSON. *N. Y. Med. J.*, **76**, 316–318.—The production of hydrochloric acid in the stomach is probably dependent upon the gastric plexuses. Other acids re-

Digitized by Google

sulting from fermentation, such as acetic, butyric and lactic acids, are also found, their presence being most frequent in the absence of hydrochloric acid. F. P. UNDERHILL.

On the Causes, Variations and Significance of the Color of the Feces. BY LEWIS A. CONNER. *N. Y. Med. News*, 81, 400–403.—The color of the normal stools of adults upon the usual mixed diet is a brown of varying degrees of darkness. This color, while due in large measure to the presence of modified bile pigment, is the result of a number of causes. The elements which go to make up the color may be grouped under the following heads: (1) digestive secretions; (2) food residue; (3) discharges from the intestinal mucous membrane; (4) accidental ingredients, such as drugs, etc.

Under normal conditions the digestive secretions have little influence in determining the color of the feces; with the usual mixed diet the food residue plays only a subordinate part. Among the discharges from the intestinal wall which may modify the color of the feces may be mentioned mucus, pus, serum and blood. Such drugs as bismuth, calomel, iron, rhubarb, senna, santonin and methylene blue are of importance in giving color to the feces. Two classes of clay-colored stools may be recognized: (1) those associated with obstructive jaundice, and (2) those due to the reduction of bile pigment to the colorless body leuco-urobilin.

F. P. UNDERHILL.

The Toxicity of Methyl Alcohol. BY REID HUNT. *Johns Hopkins Hospital Bull.*, 13, 213–225.—The symptoms of acute poisoning of animals with methyl alcohol are, in general, similar to those observed in cases of poisoning by ethyl and other alcohols of this series. The action of methyl alcohol differs from that of ethyl alcohol chiefly in the fact that the symptoms are produced more slowly, and the duration of the intoxication is more prolonged. With equal doses of ethyl and methyl alcohols, death is caused in a shorter time by the former than by the latter. In chronic poisoning of animals with ethyl and methyl alcohols, it is shown that the latter is the more toxic on equal dosage. In the case of methyl alcohol the animal always died, while in that of ethyl alcohol poisoning the animal always recovered. The reason for the toxicity of methyl alcohol may be found in the fact that, unlike ethyl alcohol, it is but partially oxidized in the body and that its administration leads to the formation within the body of a markedly poisonous acid—formic acid.

F. P. UNDERHILL.

SANITARY CHEMISTRY.

The Disinfection of Passenger Cars. BY C. B. DUDLEY AND M. E. MCDONALD. *Am. Eng. and Railroad Journal*, 76, 1902, pp.

Digitized by Google

195–198.—An account of experiments made with formaldehyde on disinfecting passenger cars. An ordinary passenger car was taken, the ventilators closed on the outside with hoods of canvas, the doors, windows and decks closed in a like manner, and wet and dry bulb thermometers placed inside the car so that they could be easily read. In the experiments only the *bacillus coli communis* was used, and test objects were distributed throughout the car, in the basket racks, on the window sills, in the seats, on the floor and also in the closets. Twenty-four test objects, in all, were used in each experiment, and control experiments were always made. The gas was generated by boiling a formalin solution, after the addition of borax, as suggested by Novy, and the amount used was about 0.40 of a quart for each thousand cubic feet of space in the car. The experiments seemed to indicate that in order to produce disinfection with formaldehyde, the air of the space to be disinfected must contain at least 70 per cent. of the moisture that it could contain at the temperature, and that disinfection took place at temperatures as low as 32° F. With a humidity below 45°, disinfection was not produced, irrespective of the amount of gas used; with a humidity between 45 and 70 per cent., the results were variable and erratic; with humidity above 70 per cent., disinfection was always successful; that as regards temperature, a temperature as low as 32° F., and perhaps as low as 25° F., did not retard or prevent disinfection, provided a sufficient amount of moisture was present in the air of the car. No experiments were made on a Pullman car, with its wealth of upholstery. The authors, however, believe that a much larger amount of moisture must be introduced into a Pullman car in order to get sterilization, than it is necessary to introduce into an ordinary car, if the air does not have the proper amount of moisture in it at the time the car is to be disinfected. To increase the humidity of the air in the car the authors recommend sprinkling the floor with water, though undoubtedly the same result may be achieved by spraying water through a small opening, such as a key-hole. LEONARD P. KINNICUTT.

The Result of Imperfect Combustion of Fuel. By EDWARD R. WARREN. *Journal Mass. Association of Boards of Health*, 12, pp. 52–74.—The author of the paper shows that on account of the use of soft coal Boston is becoming a smoke city, and how, without the use of mechanical stokers, this could easily be prevented by proper firing. He points out that Berlin, Germany, where about 3,000,000 tons of soft coal were consumed in 1900, is entirely free from the smoke nuisance, and gives as one of the chief reasons for this satisfactory condition, the existence in Germany of schools for the training of firemen, where for the nominal fee of from two to three dollars, two weeks' instruction in the art of firing and the care of boilers

Digitized by Google

is given. Reference is also made to the steps taken in Chicago, Cleveland and New York, to prevent smoke from being given off into the atmosphere, and it is stated that on account of the attention paid to the subject, and the placing of the matter under the direct control of the board of health, New York is freer from smoke than any city in the United States. The paper was followed by a discussion in which Professor Sedgwick showed a number of photographs taken during the past year in Boston, and Mr. Russel Raynor, assistant chief in the Department of Food Inspection and Offensive Trades, of New York City, gave a detailed account of the work of the Health Department in preventing the discharge of smoke and soot into the atmosphere.

LEONARD P. KINNICUTT.

The Sewage Disposal of Suburban Houses and Public Institutions. BY P. H. BRYCE. *Twentieth Annual Report of Provincial Board of Health of Ontario.* 1901. pp. 83–88.—Experience has shown that for an ordinary suburban dwelling with ten inmates the amount of sewage will amount to about 200 gallons daily, which will contain about 8,000 grains of organic matter, and 12,000 grains of mineral matter, or altogether some three pounds of solid matter. Two-fifths of this is organic, capable of undergoing decomposition, the larger part of it then going into solution. Of the mineral matter, 10,000 grains are in solution, leaving only 2,000 grains per day to be deposited, so that at the end of the year, if the sewage was passed through a suitable closed tank, about 100 pounds of mineral matter, and a comparatively small amount of organic matter, would be the total weight of matter that had to be removed from the tank. The liquid running from the tank containing only substances in solution could be readily and easily treated without creating a nuisance or pollution of ground water, if the 200 gallons of liquid were evenly distributed over an equal number of feet of soil. The tank, to receive 200 gallons of sewage daily, should be about 4 feet long, 3 feet wide and 3 feet deep, divided into two compartments, each compartment holding 100 gallons of sewage. The tank should be so arranged that the first compartment contains at least two divisions, and that the partially clarified sewage from the second division passes into the second compartment at a depth of a foot or more below the surface of the liquid. From the second compartment it should be discharged at regular timed intervals of twelve hours into land-drainage pipes. This can be done by an automatic ball valve arrangement. The top of the tank, which must contain openings for the escape of gas, should be covered over with gravel and earth. The drainage pipes should have a total capacity of 100 gallons, be laid perfectly level so that each pipe should receive its own share of sewage and no more, and should be laid a few inches below the surface of the soil. LEONARD P. KINNICUTT.

Digitized by Google

The Bacterial Treatment of Trade Waste. By WILLIAM NAYLOR. *Proc. Inst. Civil Eng.*, 1901–1902. pp. 148; *Eng. Record*, 46, 273, 1902.—Though the cost of sewage treatment is, in many cases, increased by the influx of trade waste, it is only in rare instances that difficulties have occurred in the treatment at outfall works such as to call for radical modifications of the methods of treatment commonly applied to domestic sewage. Sewage containing galvanizer's pickle (copperas and free acid), and in addition waste and wash liquors from ammonia and tar distillation shift stop liquors, will be acted upon by bacteria, after the free acid has been neutralized by lime and the iron thus precipitated. Alkali waste, after the sulphides are precipitated by ferric chloride, offers no difficulties to bacterial treatment. The waste from tanneries and glove factories may be regarded simply as strong sewage. Wool-scouring liquors cause difficulties of a mechanical rather than a bacterial character; if the amount of grease is not too large, it can be precipitated by lime treatment; if, however, the sewage contains a very large proportion of wool washings, as at Bradford, England, the precipitate formed is more or less an emulsion, which has hitherto defied pressing or handling in any form. The precipitation tank effluent, however, can be satisfactorily treated on bacterial filters. Bleach-waste and brewery-waste call for special consideration. When trade waste containing much free chlorine is applied to a bacterial filter, satisfactory results are not obtained; and when the trade waste contains starch-products, as is the case in print-works waste, color-shop waste, distillery waste or strong brewery waste, a souring takes place which very soon impairs the usefulness of the filter. This souring is largely due to the lactic acid ferment, and experiments have shown that this souring can be almost completely prevented by the introduction into the sewage of competitive and more active organisms, the anaerobic bacteria of putrid sewage. A plant, based on the above idea, probably the first installation of the kind, has been constructed at the works of Messrs. Peel, Tootal & Co., at Baxenden, England. The waste liquors contain lime, soda, chlorine and the various substances removed from the cloth (starchy sizes, china clay, etc.). The liquors are passed into a tank, holding a three days' supply. When first started, about four tons of old sewage sludge were placed in the tanks, the tanks filled with the liquor from the works, and allowed to stand four days, after which the effluent from the tanks was allowed to flow continuously through sprinkling arms upon a bacterial filter. To maintain the putridity of the liquor in the tanks, all the closets of the works are connected with the tanks, and in case of any falling off of putridity, sewage sludge is added from time to time. The working of the plant has been very successful, the filter is quite active bacterially and treats successfully 350 gallons

Digitized by Google

per square yard per day. The most noticeable feature of the process is that the free chlorine present in the waste, does not interfere in the least with the bacterial activity of the filter. Presumably it becomes combined in the septic tank with the products of decomposition set free in the putrid sewage. Plants to treat the brewery waste from the Hook Norton Brewery Co., at Banbury, and the waste from the paper mill of Messrs. Wiggins, Teape & Co., of Chorley, Lancashire, by adding putrid sewage or sewage sludge to the trade liquors, before treating them on bacterial beds, have been constructed and are working very satisfactorily. The introduction of anaerobic bacteria of putrid sewage to trade waste to prevent acid fermentation and the antiseptic action of chlorine, enables trade waste from breweries, print works and paper mills to be successfully treated on bacterial filters. In the discussion that followed the reading of the paper, Dr. Rideal stated that the author had confirmed the view that he himself held, that if the proper sequence of bacterial processes was adopted, practically all kinds of organic matter would break down and give satisfactory effluents. "By proper sequence he meant, not the method adopted five or six years ago, following the work of the Massachusetts State Board of Health, of attempting to effect the whole decomposition in a contact bed, but the realization of the absolute necessity of bringing about a preliminary decomposition of an anaerobic character before passing the liquid into a filter bed where it was undergoing oxidizing influences." He also said that in experiments he had made, he had found that chlorine had a marked sterilizing effect only when the organic matter had been partially removed, and consequently bacterial treatment was consistent with the presence of chlorine in those cases in which the absorption of free chlorine, by some of the organic matter first took place.

LEONARD P. KINNICUTT.

In a paper read in September, 1902, before the annual meeting of the Sanitary Institute, Mr. Frank Scudder, of the Mersey and Irwell Commission, states that the results of the experiments he has made in adding sewage sludge to starchy liquors, do not confirm the results obtained by Naylor.

LEONARD P. KINNICUTT.

The Prevention of the Pollution of Streams by Modern Methods of Sewage Treatment. BY LEONARD P. KINNICUTT. *Science N. S.*, **16**, 161–171, 1902.—A review of the various methods used for removing the polluting and putrefying substances contained in sewage. Dilution, chemical treatment, sewage farming, intermittent filtration, septic treatment, contact-bed treatment, and percolating filters, are described and discussed. As the result of his investigations the author draws the

Digitized by Google

following conclusions: that sewage farming as a general method of sewage treatment is not practicable and seldom possible. That chemical treatment only removes a part of the polluting substances in the sewage. It is a partial or preliminary treatment, advisable only in cases where sewage contains germicidal substances, preventing the use of the septic tank. That intermittent filtration is the best method for the treatment of sewage of cities where sand can be easily and cheaply obtained, though the amount of sewage that can be treated per acre per day is not over 75,000 gallons, unless the septic tank is used in connection with the process. That the septic tank process is a most valuable adjunct and almost an essential part to all bacterial methods of sewage treatment.

That the contact method is not adapted and should not be used for the treatment of crude sewage, but can be considered a very satisfactory method for the treatment of sewage after it has undergone putrefaction in the septic tank.

That percolating filters, though capable of treating much greater quantities of sewage per acre than can be done by any other method are still in the experimental stage.

LEONARD P. KINNICUTT.

INDUSTRIAL CHEMISTRY.

Theory of the Incandescent Mantle. BY A. H. WHITE AND A. F. TREVER. *J. Soc. Chem. Ind.*, August 15, 1902.—These authors begin by referring to a previous paper from the same laboratory (Univ. of Mich.) upon this subject. As this is abstracted on a later page of the journal we will give the conclusions there stated. These were: (1) The consumer's method of adjusting an incandescent burner to give a maximum illuminating power also gives the greatest efficiency; (2) This method of adjustment is also the proper one when gases are to be tested with incandescent mantles. A test with a fixed consumption for several gases will be unfair to one or all; (3) Under a gas pressure of 2 inches water when the burner is adjusted to give the maximum illuminating power, the number of candles per cubic foot of gas consumed will increase almost directly with the net calorific value, increasing at the rate of one candle per cubic foot for every four calories in the net heating value; (4) The maximum temperature of a mantle does not vary markedly with a change in the illuminating power. The average temperature of the mantle may vary. The temperature of the mantle is less than that of the hottest zone of a freely burning flame under the same conditions. The conclusions of this second paper are: the temperature of the commercial mantle burned under usual conditions will vary from 1500° to 1600° C. For any single mantle, the illumination will vary with the temperature; for different

Digitized by Google

mantles, the illumination will depend to a greater degree upon the composition of the mantle than it will upon the temperature. The mantle with the highest temperature does not necessarily give the most light. A mechanical mixture of thorium and cerium oxides when exposed to a flame gradually increases in temperature and illumination till these approximate what would initially be shown by oxides prepared from the mixed nitrates, but the temperature remains below that which pure oxide of thorium would attain in the same flame. It is concluded that the exceptional efficiency of the mantle is due to a solid solution of the oxide of cerium in the oxide of thorium, and that this substance is capable of transforming the heat of the flame into light more economically than a black body or any other substance yet known. S. P. SADTLER.

Sulphuric Acid by Electrolysis. BY CHAS. B. JACOBS. *Eng. and Min. J.*, August 2, 1900.—Mr. Chas. B. Jacobs has been working on the electrolytic oxidation of sulphur dioxide in aqueous solution, using a concentrated solution and low current density at the anode. In Jacobs' apparatus, the anode is a porous composition through which the gas is injected in a continuous stream into the cell; and the anode area is thirty-three times that of the cathode. In the apparatus used, the vessel is provided with horizontal electrodes and an interposed diaphragm. The porous anode constitutes a partition near the base of the cell and into the lower compartment so formed, sulphur dioxide is injected through the pipe, passing through the anode and undergoing oxidation therein. An outlet is provided for withdrawal of the sulphuric acid when the hydrometer shall indicate that the required density has been reached. A refrigerating jacket is provided in order that advantage may be taken of the increased solubility of sulphur dioxide at 0° C. By continuously injecting sulphur dioxide the sulphuric acid may be brought to standard concentration. The reaction is quantitative but the electrical efficiency is only 54 per cent. The result is attained with a potential of two volts and a current density of 15 to 20 amperes per square foot of anode surface. S. P. SADTLER.

On Some Recent Advances in the Fire-Proofing Treatment of Wood. BY SAMUEL P. SADTLER. *Science*, Sept. 12, 1902. —Before describing the treatment specially commended, the qualities which should be possessed by the chemical used in making wood fire-resistant are summarized as follows: (1) It must not be of a hygroscopic nature, because in such case it would destroy paint and keep the surface of the wood in an undesirable, moist condition. For this reason, the chlorides of calcium, magnesium, and zinc are excluded, although an attempt has recently been made in a German patent to produce for this purpose

Digitized by Google

a basic chloride of calcium which, it is claimed, is free from this drawback and is recommended for fire-proofing of wood. (2) It must not be a volatile substance, because in such case it will gradually be liberated from the cells of the wood and show as an efflorescence, besides leaving the wood after a time weaker in its fire-resistant character. The ammonium salts, notably the sulphate and chloride, will not stand this test at all satisfactorily. In the dry kiln, the liberation of ammoniacal gas begins already at 125° F., and the efflorescence is frequently recognizable even when the surface has been varnished, if the wood has been exposed to strong sunshine for any length of time. Of course, such efflorescence speedily ruins the appearance of a varnished wood. (3) The chemical used must not allow fungus growth, for in such case the wood will decay more rapidly than untreated wood. Here again the ammonium salts, including the phosphate as well as sulphate, are unsatisfactory, as when the conditions of warmth and moisture are favorable the treated wood develops a fungus rapidly and deteriorates in strength. (4) If possible, the chemical should have exactly the opposite character; *viz.*, a distinct preservative effect so that the life of the treated wood should exceed that of the untreated wood. (5) There should be no noxious gas liberated in the heating or carbonizing of the wood. (6) The chemical used must not be poisonous in character, so that splinters impregnated with it, if by accident run into the flesh or wounding it, shall not endanger life or health. (7) It should not cause the corrosion or rusting of metal, which in the form of screws or bolts are passed through it. (8) The cost must be moderate, as its practical utilization will be impossible if the materials be such as to make the process an expensive one. Mr. Jos. L. Ferrell, of Philadelphia, has carried out a series of experiments extending over several years and has, to all appearances, developed a process which shows a notable advance over what had previously been done. His apparatus was described and figured in the *Scientific American*, of July 28, 1900, and need not be specially taken up here. He has, however, found in aluminum sulphate a compound that seems to answer all the requirements above stated. It has the additional feature of no slight importance in its bearing upon the fire-proof effect that when strongly heated, it leaves an infusible and non-conducting residue to cover and protect cellular structure throughout the wood. It absolutely prevents the propagation not only of flame throughout the wood but even of a glow, because of its non-conducting and unalterable character. It seems too, to be much more efficient than an alum solution.

An actual experiment, one of a large number which the writer carried out jointly with the inventor, will illustrate this. If a piece of wood be saturated with a solution of sulphate of alumina

Digitized by Google

of 30° B. strength to a depth of not more than three-eighths of an inch from the surface, and the point of the inner blue cone of a strong Bunsen flame be made to impinge upon it and kept in such a position, a boring effect takes place while an abundant separation of alumina will be observed. The average resistance of a piece of one-inch white pine so treated to the complete boring result with final penetration to the other side will be over three hours. If a similar piece of one-inch white pine be "heart saturated" with ten times the quantity of sulphate of ammonia and the same Bunsen flame be applied under exactly similar conditions, the average resistance to complete penetration will not be over seventy minutes. These results have been obtained repeatedly and in instances the disproportion was much greater.

Some very interesting observations have been made on the physical changes which the fire-proofing material undergoes on the continued application of heat. As a result of repeated measurements, it is found that the residual alumina occupies a space from two and a half to three times as great as the dried salt from which it is formed. Hence in forming, it apparently expands to fill out the air spaces and intercellular spaces of the wood very fully. This results in the formation of a very compact non-conducting barrier which interposes itself to the action of the flame and protects the layers of woody tissue upon which it is formed. The protection is therefore a real and much more lasting one than that which could come from the liberation of a gas whose action from the nature of things could be evanescent only. Physical tests made upon the wood treated by the Ferrell process have also established fully that the wood is not weakened in any degree nor injured in its structural characters.

S. P. SADTLER.

What are the Requirements of a Course to Train Men for Work in Technical Chemistry? BY WILLIAM A. NOYES. *Science*, 15, 382–384, 1902.—The author insists that a broad training in chemistry is of far more importance than instruction in the details of industrial processes. To general quantitative analysis especial attention should be devoted, and a thesis involving original work should be required at the end of the course. As accessory subjects, physics, mathematics, language, machine design, and engineering tests of materials are of most value. In the reviewer's opinion, the large amount of time often devoted to mineralogy, geology, and other descriptive sciences and special branches of technical analysis would be better utilized for instruction in engineering subjects. A. A. NOYES.

Liquid Fuel Combustion. BY C. E. LUCKE. *Age of Steel*, July 12 and 19, 1902.—Paper read before American Society of Mechanical Engineers. Distinguishes three classes: (1) Burn-

Digitized by Google

ing in air without previous treatment by air or heat. (2) "Bunsen effects"; *i. e.*, the oil is vaporized, mixed with air, and burnt. (3) Oil is vaporized, mixed with air, and used explosively. The discussion will interest any one contemplating using liquid fuel. J. W. RICHARDS.

Manufacture of Cement from Blast-furnace Slag. *Iron Age*, July 17, 1902.—A description of the Curtin plants, of which six are now operated. The slag must contain less than 1.2 per cent. of sulphur and less than 3 per cent. of magnesia; the limestone used with it must be pure; dolomite cannot be used. Illustrations are given of the plant of the Stewart Iron Co., at Sharon, Pa., which will have a capacity of 500 barrels per day. The slag is granulated in water at the furnace, dried, ground, mixed with lime, and burned, then pulverized and sacked. The cement is applicable to all uses of Portland cement except for sidewalks. J. W. RICHARDS.

Production of Phosphorus. *Eng. Min. J.*, Aug. 9, 1902.—According to the census report, 487,690 pounds were produced in the United States in 1900, valued at $150,000. The three producers use the electric furnace, by which 17 of the 20 per cent. of phosphorus in calcium phosphate is obtained. The old charcoal processes yielded only 11 per cent. J. W. RICHARDS.

Production of Minor Chemicals in the United States. *Eng. Min. J.*, Aug. 9, 1902.—A summary of the weight and value of over forty chemicals produced in 1900, taken from the census report. J. W. RICHARDS.

A New Source of Sulphuric Acid. *Iron Age*, July 10, 1902.—The hydrogen sulphide developed as a by-product in the refining of asphaltum at the California Asphaltum Company's works at Ventura, Cal., is burned to sulphurous anhydride and converted into sulphuric acid in lead chambers. The present production is 10 tons of high-grade acid daily. J. W. RICHARDS.

AGRICULTURAL CHEMISTRY.

Capillary Studies and Filtration of Clay from Soil Solutions. BY L. J. BRIGGS AND M. H. LAPHAM. *U. S. Dept. Agr., Bureau of Soils, Bull. No. 19*, pp. 40.—Three technical papers are presented in this bulletin. Studies of the influence of dissolved salts (sodium chloride, sulphate, and carbonate) upon the capillary rise of water in soils showed in general no increase in capillary activity due to dissolved salts, while concentrated solutions materially diminished the extent of such action. The capillary rise was considerably greater with sodium carbonate than with neutral salts in solutions of equal concentration. Studies of the

Digitized by Google

capillary movement of water in dry and moist soils showed that the capillary rise of water in dry soil does not represent the extent of such action in soil under field conditions. Attention is called to the desirability of determining the limits of capillary movement in different soils when dry and when moist for the purpose of ascertaining if a general relation can be established. "The true limit of capillary movement may be determined by finding the limiting height of a soil column, from the upper surface of which evaporation proceeds at a finite, continuous, and approximately uniform rate, the supply being obtained from a reservoir at the base of the column." The filtration of suspended clay from soil solutions is discussed and an apparatus consisting essentially of an unglazed porcelain filter tube connected with a filter-pump, which has been used successfully for this purpose, is described. H. W. LAWSON.

Experiments in Evaporation. BY C. B. RIDGAWAY. *Wyo. Agr. Expt. Sta. Bull.*, No. 52, pp. 45–55.—In the method used in the experiments a tube 6 inches in diameter and 26 inches long was filled with undisturbed soil by driving it into the ground and then was so connected with a drum and another tube that subirrigation could be practiced. The whole apparatus was buried in the ground so that the top of the tube was on a level with the suface of the soil. With the water level maintained at 6 inches below the surface the evaporation from the soil was 95 per cent. of that from a water surface, and with the water level at 22 inches the evaporation was 35 per cent. Stirring the soil once a week to depths of 2, 4, and 6 inches retarded evaporation, respectively, 19, 23, and 45 per cent., the water level being maintained at 22 inches below the surface. With the water at the same level, evaporation was retarded 57 per cent. in soil containing 0.62 per cent. of sodium carbonate. The alkali was added to the soil at the beginning of each test in 5 or 10 per cent. solutions by means of subirrigation and at the end of the crop season much more was found in the surface soil to a depth of 3 inches than at any other level.

H. W. LAWSON.

Field Experiments with Nitrate of Soda on Market Garden Crops. BY E. B. VOORHEES. *N. J. Agr. Expt. Sta. Bull.*, No. 157, pp. 20.—The effect of different quantities of nitrate of soda was tested with carrots, cabbages, celery, tomatoes, peppers, turnips, and sweet corn, and different methods of application were compared. The results as a whole indicate that a liberal supply of available nitrogen improves both the yield and quality of vegetable crops and that the use of 300 to 400 pounds of nitrate of soda per acre in three applications is preferable to the use of smaller quantities. H. W. LAWSON.

Digitized by Google

Fertilizer Tests on Tomatoes. By H. A. Huston. *Ind. Agr. Expt. Sta. Bull.*, No. 92, pp. 107–115.—In field experiments with tomatoes on a heavy clay loam soil the best results were obtained by using a complete fertilizer in liberal amounts. The use of nitrogenous fertilizers alone was unprofitable. Barnyard manure gave a larger yield than commercial fertilizers but prolonged the ripening period. The use of commercial fertilizers in tomato growing is considered profitable and it is believed that on soils of the type used in the experiments and where clover is grown in rotation, a fertilizer made up of 3 per cent. of nitrogen, 7 per cent. of available phosphoric acid, and 12 per cent. of potash would be as serviceable as one containing more nitrogen. Earlier experiments at the station indicated that the sulphate of potash is superior to the muriate as regards the quality of the tomatoes. H. W. Lawson.

Agriculture in Its Relations to Bacteria and other Ferments. By H. W. Wiley. *Jour. Franklin Inst.*, 154, 81–90, 161–169.—A general discussion of nitrification, denitrification, and assimilation of nitrogen by plants. H. W. Lawson.

A Study of the Enzymes of Green Sorghum. By H. B. Slade. *Nebr. Agr. Expt. Sta. Rep.*, 1901, pp. 55–62.—In connection with A. T. Peters the author has been investigating the cause of sorghum poisoning in cattle. Analyses of the stalks of green sorghum indicated the presence of a number of enzymes, among which diastase, glucase, catalase, and an oxydase were identified. The enzymes thus far found do not appear to be the source of poisonous products. H. W. Lawson.

Spontaneous Combustion of Alfalfa. By H. M. Cottrell. *Kans. Agr. Expt. Sta., Bull. No. 109*, pp. 217–222.—Six instances of spontaneous combustion of alfalfa hay are reported. In every case the hay was from the first cutting. As the early growth of alfalfa is usually rank and cut during May or early June, when the weather is often damp, the cause is attributed to imperfect curing. H. W. Lawson.

Preliminary Report on Steamed Silage. By J. Withycombe and A. L. Knisely. *Oregon Agr. Expt. Sta., Bull. No. 92*, pp. 187–201.—The aim of the station in this work has been to secure corn silage approximately free from organic acids. Experimental silos were constructed and filled with cut corn fodder in the ordinary way. In several cases salt was added at the rate of 1 pound to every 100 pounds of fodder, and in other cases the fodder, after being put into the silo, was subjected to steam for several hours. Analyses made of untreated silage showed from 9.74 to 10.59 per cent. of organic acids calculated to water-free material. The sugars (cane and invert) had decreased during several months from 17.40 and 17.79 per cent. in the fodder to 1.22 and 1.40 per cent. in the silage. Salting did not prevent,

Digitized by Google

to any great extent, fermentation and the formation of acids. Steamed silage underwent the fewest changes. The acidity calculated to water-free material amounted to only 1.62 per cent., while practically no change took place in the quantity of sugars. As the work so far reported is only preliminary, no conclusions are drawn by the authors. H. W. LAWSON.

Progress of the Beet Sugar Industry in the United States in 1901. BY CHARLES F. SAYLOR. *U. S. Dept. Agr., Rep. No. 72*, pp. 9–89.—This part of the report deals with the operations of the beet-sugar factories in the United States, methods of sugar-beet culture, and various problems connected with the industry. Considerable statistical matter is presented. The 36 factories in operation in the United States, in 1901, produced 369,211,733 pounds of sugar. The average sugar content of the beets was 14.8 per cent. and the coefficient of purity 82.2 Emphasis is laid upon the feeding value of beet pulp. H. W. LAWSON.

Sugar Beet Experiments in 1901. BY J. D. TOWAR. *Mich. Agr. Expt. Sta. Bull.*, No. 197, pp. 117–144.—Some of the results of the various experiments may be briefly noted as follows: The highest yield of sugar was obtained from beets planted May 8th. A complete fertilizer made up of 200 pounds of nitrate of soda, 200 pounds of muriate of potash, and 400 pounds of dissolved phosphate rock was generally more satisfactory than one in which one of the elements was deficient or in excess. Nitrate of soda was superior to sulphate of ammonia. Barnyard manure in comparison with other fertilizers generally increased the yield of beets but decreased the sugar content. Sugar beets were shown to be an exhaustive crop. Beets sampled the first week in November showed the highest sugar content. The percentage of sugar in beets stored in piles in the field increased at first out of proportion to the loss in weight. During the first mouth the increase in the actual sugar in the beets amounted to about 14 per cent. while during the second month the loss was so great as to make the total loss for the period nearly 10 per cent. Sugar-beet seed from one to four years old showed practically no difference in vitality. Beets affected with leaf curl showed only 5 to 7.5 per cent. of sugar. The average sugar content of beets weighing eight ounces was 2 per cent. more than that of beets weighing thirty-two ounces. H. W. LAWSON.

Sugar and the Sugar Beet. BY JOHN WADDELL. *Pop. Sci. Mo.*, 61, 157–162.—A brief discussion on the progress of the beet-sugar industry in different countries. H. W. LAWSON.

The Sugar Beet as a Reclaimer of Arid and Alkali Regions. BY HENRY C. MYERS. *J. Soc. Chem. Ind.*, 21, 834–838.—In a previous article, to which reference is made, it was shown that sugar beets of good quality can be grown on soils containing

Digitized by Google

alkali in quantities sufficient to prevent the culture of most other crops, and that the beets tend to improve such land by taking up the excess of alkali. In the present paper an account is given of the successful culture of sugar beets upon an alkali soil in Utah where cultivation had never been attempted. Artesian water was used for irrigation, one plat receiving only a limited supply without drainage and another plat a larger supply conducted away by ditches. Analyses of the beets of plat 1 showed 14.8 per cent. of sugar with a purity of 81.3 and that 188.2 pounds of alkali had been removed per acre. Analyses of the beets of plat 2 showed 14.1 per cent. of sugar with a purity of 84.9 and that 102.1 pounds of alkali had been removed. In addition, the tops removed from plat 1, 134.3 pounds of alkali per acre. Plat 2 comprised six acres and produced 90.6 tons of beets. Analyses are given of the irrigation water and of the soil before planting and after harvesting. H. W. LAWSON.

Certain Relations of Plant Growth to Ionization of the Soil. BY A. B. PLOWMAN. *Am. J. Sci.*, 14, 129–132.—In experiments at Harvard University, germinating seeds in water or soil cultures placed near the anode were killed by a current of 0.003 ampere in about 20 hours, while seeds near the cathode were rarely injured in that time and in general were stimulated. When the current was continued longer or when a relatively heavy current was used for only a short time the injurious effects were extended to all points between the electrodes. The effects produced are attributed to the electrical charges rather than to the chemical action of the ions. It is argued that in the region of the anode there would be a slight excess of positive ions, and in the region of the cathode an excess of negative ions; and the conclusion is drawn that negative charges stimulate and positive charges paralyze the embryonic protoplasm of plants. Several facts are advanced in support of this theory. H. W. LAWSON.

A Chemical Study of the Sea Island Cotton-Seed. BY F. S. SHIVER. *S. C. Agr. Expt. Sta. Bull. No. 68*, pp. 90.—Analyses are reported of the seed, kernels, hulls, linters, lint, and meal of two varieties of Sea Island cotton, and the results are compared with similar data for Upland or ordinary cotton. The following table summarizes some of the analytical data presented in the bulletin:

AVERAGE COMPOSITION OF SEA ISLAND COTTON-SEED AND ITS PRODUCTS,

	Seed. Per cent.	Kernels. Per cent.	Hulls. Per cent.	Linters. Per cent.	Lint. Per cent.	Meal. Per cent.
Moisture	8.05	6.47	10.29	6.93	5.91	9.24
Protein	20.96	34.00	6.71	3.88	2.30	28.43
Fat	19.71	34.65	3.04	2.27	1.10	7.86
Nitrogen-free extract	31.44	16.80	44.73	11.29	8.03	33.41
Crude fiber	15.31	2.31	32.22	73.20	81.04	15.92
Ash	4.53	5.77	3.01	2.43	1.62	5.14
Nitrogen	3.35	5.44	1.07	0.62	0.37	4.55
Phosphoric acid	1.63	2.68	0.39	0.20	0.13	1.89
Potash	1.62	1.73	1.35	0.51	0.57	1.68

Digitized by Google

Determinations were made of the constants of Sea Island cotton-seed oil as follows: Refractive index at 23.6° C., 1.4718, and saponification equivalent 215. A study of the form in which phosphoric acid is present in the meal led to the conclusion that a part is in the form of metaphosphoric acid and pyrophosphoric acid, and that only a small part is in the ortho form. The value of Sea Island cotton-seed as a feeding-stuff and as a fertilizer is discussed at some length. H. W. LAWSON.

Yearbook of the United States Department of Agriculture. *U. S. Dept. Agr., Yearbook*, 1901, pp. 846.—The yearbook for 1901 has been prepared on the same general plan as in the past. The report of the secretary gives a general review of the operations of the department during the year. Thirty-three miscellaneous articles, more or less popular in character, cover in a general way the lines of work carried on in the department. Articles of particular interest from the standpoint of agricultural chemistry are as follows: The Purpose of a Soil Survey, by Milton Whitney; The Relation of Nutrition to the Health of Plants, by Albert F. Woods; The Cotton Seed Industry, by C. M. Dougherty; The Influence of Environment on the Chemical Composition of Plants, by H. W. Wiley; Dietaries in Public Institutions, by W. O. Atwater; and Progress of the Beet Sugar Industry in the United States, by C. F. Saylor. The appendix contains the usual statistical matter and information of interest to farmers. H. W. LAWSON.

The Prevention of Molds on Cigars. BY R. H. TRUE. *Science*, 16, 115.—The occurrence of molds on cigars in the manufacture of which tragacanth paste was used for fastening the wrapper leaves was prevented by making up the paste with a saturated solution of boric acid instead of water. H. W. LAWSON.

Proceedings of the Eighteenth Annual Convention of the Association of Official Agricultural Chemists. EDITED BY H. W. WILEY. *U. S. Dept. Agr., Bureau of Chem., Bull. No. 67*, pp. 184.—This is a detailed account of the proceedings, of which a summary has already been given in this Journal, R. **24**, 42. H. W. LAWSON.

Human Food Investigations. BY H. SNYDER. *Minn. Agr. Expt. Sta. Bull. No.* 74, pp. 107–174.—Studies were made of the digestibility and nutritive value of beans, butter, cheese, oatmeal, bread, and other foods, and of the digestive power of the enzymes in milk. In experiments with working men a ration containing butter was more digestible than the same ration with the butter replaced by oleomargarine. Bread made from patent roller process flour was more completely digested than that made from entire wheat or Graham flour. The protein

Digitized by Google

in toast was not as digestible as that in bread, though artificial digestion experiments showed that toast is more easily digested. A ration containing milk was more completely digested than the same ration without milk. In artificial digestion experiments fresh milk was used in the place of pepsin solution, the results showing that milk acts as a digestive fluid.

H. W. LAWSON.

Cereal Breakfast Foods. By L. H. MERRILL AND E. R. MANSFIELD. *Me. Agr. Expt. Sta., Bull. No. 84*, pp. 129–152.—Analyses of samples of 8 corn preparations, 14 oat preparations, 19 wheat preparations, 5 malted foods, and 4 miscellaneous preparations collected during the present year are reported and the nutritive value and cost of the different brands are discussed. The average percentage composition of the three chief classes of these foods was as follows: *Corn preparations*—water 10.2, protein 8.7, fat 0.6, crude fiber 0.3, nitrogen-free extract 79.9, and ash 0.3 per cent; *oat preparations*—water 8.4, protein 15, fat 7.2, crude fiber 0.9, nitrogen-free extract 65.6, and ash 1.9 per cent.; *wheat preparations*—water 9, protein 12.4, fat 1.9, crude fiber 1.3, nitrogen-free extract 73.9, and ash 1.5 per cent. As a rule these foods are considered very economical as compared with meats and vegetables. H. W. LAWSON.

Inspection and Analyses of Foods. By R. M. ALLEN. *Ky. Agr. Expt. Sta., Bull. No. 100*, pp. 86–147.—Analyses are given of 748 samples of various food products examined during 1901. Of this number, 227 were found adulterated. H. W. LAWSON.

PATENTS.

APRIL 29, 1902.

699,033. Armand J. Stiegelmann, Ludwigshafen, Germany. Assignor to Badische Anilin und Soda Fabrik, Bavaria, Germany. **Making resist white under indigo.** Prints a resist of thickening, glycerol and lead peroxide, drying, dyeing with indigo, then working in dilute hydrochloric acid.

MAY 6, 1902.

699,155. Jules Dodge, Paris, France. **Artificial silk.** Washes pyroxylin, centrifuges it, dries to 6 to 10 per cent. water, then dissolves in a mixture of alcohol, ether, and an aqueous alkaline solution.

699,216. Ernst Murmann, Vienna, Austria-Hungary. **Aluminum alloy.** Aluminum, 100; copper, 3 to 16; zinc, 2 to 12; but always twice the copper.

699,258. John M. Stukes, San Antonio, Texas. **Dry packing for eggs.** Dry shale dust, 500; gypsum, 25; wood ashes, 25; sulphur, borax, saltpeter, and salicylic acid each 1 part.

Digitized by Google

699,282. Henry S. Blackmore, Mt. Vernon, N. Y. **Reducing metals and making alloys.** The process of reducing aluminum which consists in exposing aluminum oxyfluoride to the action of calcium carbide and heat. Claims also the action of heat and a metallic carbide on other metals capable of combining with the electro-negative constituent of the compound.

699,358. Burhans Van Steenbergh, New York, N. Y. Apparatus for the manufacture of **carburetted hydrogen gas.** A generating chamber, a fixing chamber, electric water or steam decomposing chamber, said generating and fixing chamber provided with electric incandescent heaters, and said decomposing chamber adapted to deliver free hydrogen into the generating chamber, and adapted to conduct the oxygen to a storage holder.

699,383. Adolph Gentzsch, Vienna, Austria-Hungary. **Insulating compound.** Caoutchouc and carnauba wax are kneaded together under a mild heat increased gradually during the operation to form a plastic mass.

699,414. Charles J. Reed, Philadelphia, Pa. **Electrolyzing solutions of salts.** A solution of sodium chloride is electrolyzed in a plurality of reducing cells containing a mercury cathode, in series with a less number of oxidizing cells, transferring the resulting amalgam, and the current from each reducing cell to the next oxidizing cell in the series and transferring the amalgam from each oxidizing cell to the next reducing cell in the series without thereby transferring the current to obtain sodium hydroxide and chlorine.

699,422. Wilhelm Sternberg, Berlin, Germany, assignor to Chemische Fabrik auf Actien, vorm. E. Schering, same place. **Methylene citric acid.** Formaldehyde, preferably polymerized, reacts on citric acid, forming a white crystalline powder, difficultly soluble in cold, but easily in hot water, and melting at 208° C.

699,423. Wilhelm Sternberg, Berlin, Germany. **Dimethylene tartrate.** Tartaric acid is treated with formaldehyde in presence of a condensing agent and the product separated in fine needles that melt at 120° C. and are easily soluble in alcohol, acetone and chloroform.

699,492. Rufus N. Chamberlain, Depew, N. Y. **Storage battery plates.** Makes the plate the anode in an electrolytic bath which produces a chemical reaction that forms an oxidized coating on the plate, then shifting the plate into the position of cathode and introducing an unoxidized plate as anode whereby the reduction of oxide on the first plate reduces the energy required for the second.

699,541. Peter Lutz, Bamberg, Germany. **Preservative for**

Digitized by Google

violin strings. Paraffine oil, 45; benzene, 45; and camphor spirit, 7 parts.

699,555. David J. Ogilvy, Cincinnati, O. **Paint drier.** Manganese dioxide, 400; lead oxide, 180; and calcium hydroxide, 220, with rosin oil 2,500 parts heated and thinned for use.

699,571. Emilien Rocca, Marseilles, France. **Refining oil.** Passes the oil through a Coffee still while a current of steam, finely divided, goes in the opposite direction, and heat is applied at successive points to prevent condensation.

699,581. Paul Seidel, Ludwigshafen, Germany. Assignor to Badische Anilin und Soda Fabrik, same place. **Indigo diacetic acid.** Anthranilic acid is treated with two molecules of haloid acetic acid, and the product is treated successively with caustic alkali water and air. The product is soluble in hot water, crystallizing on cooling, melts and decomposes on heating, and is readily soluble in alcohol and ether.

MAY 13, 1902.

699,684. Edward Holm, Chicago, Ill. **Incrustation preventative.** Zinc 7, tin 4, antimony 3, mercury 1 ounce, and nitrate of silver, 2 grains, the relative proportion of constituents diminishing in the order named.

699,713. Leonard M. Randolph, Newark, N. J. **Plastic compound.** Mixes equal parts of varnish residue and peat, dries, pulverizes, heats, and adds 10 to 20 per cent. oakum, mixes thoroughly, heats till dry, and grinds to make a molding material.

699,907. George J. Atkins, London, England. **Electrolytic apparatus** for making certain salts adapted to produce **chlorine.** A long trough lined with an anode, a cylinder cased in sheet lead adapted to rotate in said trough, a flexible scraper, inlets and outlet for electrolyte, and a current of about 4 volts.

699,933. Claus A. Spreckels and Charles A. Kern, New York, N. Y. Assignors to Federal Refining Co., Jersey City, N. J. **Refining sugar.** Mixes with the sugar solution a sulphonated derivative of a resinous body and separates the impurities with the sulphonic acid compound.

699,979. Herman van Rom, Stuttgart, Germany. **Preserving meat.** Impregnates meat with an infusion of tea.

700,090. William G. Roach and Albert C. Roach, Cincinnati, Ohio. **Coloring marble.** Heats the slabs to 212° F., then applies dyes dissolved in coal oil, finally coats with paraffin.

700,099. Claus A. Spreckels and Charles A. Kern, New York, N. Y., assignors to Federal Refining Co., Jersey City, N. J. **Treating sugar crystals.** Washes the mass with a sulpho-oleaginous body, or a sulphonated derivative of a resinous body, and separates the impurities and sulpho body.

Digitized by Google

MAY 20, 1902.

700,281. Edouard Douillet, La-Garonne-Colombes, France. **Refining oils.** Passes a current of alcoholic vapors through the oil, followed by steam, and finally filtering.

700,229. Tomasso Parzaile, Alexandria, Egypt. **Making soap.** Mixes cold cottonseed oil with flour containing gluten, allows the mixture to stand, and then adds caustic soda.

700,249. Amedee M. G. Sebillot, Paris, France. **Sulphuric acid apparatus.** Two towers connected by a pipe at bottom with a forcing fan, one tower filled with pumice stone and asbestos, in the middle two-thirds, and covered with spongy platinum, with perforated plates at top, inclined baffle plates in the second tower, and pipes for steam and air.

700,284. Otto P. Amend, New York, N. Y. **Mordanting animal fiber.** Treats the fiber with a solution of free chromic acid at such temperature as will not oxidize the fiber (below 160° F.).

700,311. Francis Ellershausen, London, England. Assignor to Sulphides Reduction (new process), same place. **Treating refractory ores.** They are smelted, the fumes churned with water, when they contain lead, silver and zinc, the lead, silver, and part of the zinc are settled out, this sludge is separated, dried and fused with caustic alkali, whereby the lead is got in metallic form, and caustic soda and zinc sulphide recovered.

700,389. Alexander E. Tucker, Birmingham, and Colin Corey, Swansea, England. **Artificial fuel.** Mixes finely divided fuel with an agglutinant of sago meal and oily matter.

700,390. Paul Bary, Paris, France. **Electrically pulverizing metals.** Causes the metal to flow in a stream, passing electric currents throughout the length thereof, breaking the stream at a point in the flow traversed by the electric current to enable the latter to act on the metal on each break of the circuit.

700,421. Emil Helbing, Wandsbeck-Hamburg, Germany. **Peat briquettes.** Impregnates peat with milk of lime and oxide of magnesia in its natural state, presses and molds.

700,446. Saxton C. Shoup, Fostoria, Ohio. **Preserving compound.** Sulphur 150, magnesia 2, charcoal 16, molasses 16, chalk 2, and alum 4 parts, by weight.

700,464. Theodor Weyl, Charlottenberg, Germany. Assignor to Siemens and Halske, Aktiensgesellschaft, Berlin, Germany. **Sterilized carbonated waters,** made by treating the liquid with carbon dioxide and then with ozone under pressure till sterile.

700,471. Charles Bernadac, Paris, France. **Nitrocellulose and casein compounds.** Forms a plastic mass of casein with an aqueous solution of borax, removes a part of the water, and im-

Digitized by Google

merses the mass in alcohol; to displace a part of the water, removes excess of liquid and kneads the mass with nitrocellulose into a homogeneous compound.

700,512. Constantin Krauss and Rudolph M. von Berneck, Hochst-on-Main, Germany. Assignors to Farbwerke, vorm. Meister Lucius and Bruening, same place. **Making sulphuric acid.** Exposes burnt pyrites to burner gases at 350° C., then at 600° C., the pyrites saturated with ferrous sulphate.

700,521. Ernesto Lurati, Traun near Lintz, Austria-Hungary. **Fixing indigo.** Pads the whole of the material with a naphthol mordant, containing potassium ferrocyanide, then prints portions with an azo dye and a reserve, then dyeing with indigo, and finally treating with acid.

700,529–30. Ananias D. Miller, Mt. Pleasant, Pa. The first a **flux** of asbestos 1, borax 100, and potassium permanganate 2 parts, and the second for heating ores with said flux.

700,537–8. John D. Moore, New York, and Fred. M. Martin, Brooklyn, N. Y. The first for apparatus for **generating sulphur dioxide,** and the second filling rooms with it for disinfecting, fire extinguishing, etc. A generator or burner, and a manifold and system of pipes with pump and valves.

700,555. Samuel W. Parr, Urbana, Ill. **Determining the heating capacity of combustibles.** Mixes in a closed vessel the combustible and sodium peroxide or similar oxidizer, places the vessel in water, ignites so that the products shall be solids, and takes the temperature of the water before and after reaction.

700,563. Samuel P. Sadtler, Philadelphia, Pa. **Extracting ores and scrap.** Dissolves sulphide ores in caustic alkali with any halogen, and treats the mixture with an electric current in a cathode cell, the anode being separated and containing caustic alkali.

700,565. Conrad Schraube and Hans T. Bucherer, Ludwigshafen, Germany, assignors to the Badische Anilin und Soda Fabrik, same place. **Azo dye.** Combines 1,8,3,6-naphthalenediaminedisulpho acid with a diazo body and acetone. The sodium salts are soluble in water violet-red to blue, in concentrated sulphuric acid blue to green, and on boiling with one per cent dilute sodium carbonate are not decomposed.

700,602. Godfrey Bamberg, London, England. **Making detergents.** Mixes oatmeal and olein, and adds caustic alkali and exposes to the air till all free alkali is carbonated.

700,616. Alexander Classen, Aachen, Germany. **Converting cellulose into fermentable sugar.** Subjects moist sawdust to vapors of sulphuric anhydride, then heats and boils the mass with water.

Digitized by Google

700,631. Emile von Dungern, Frankfort-on-Main, Germany. Assignor to the Farbwerke, vorm. Meister Lucius und Bruening, Hochst-on-Main, Germany. **Modified milk.** Adds a rennet ferment to cow's milk and breaks up the casein coagulate into fine flakes that remain in suspension.

700,671–2. Max Buchner, Mannheim, Germany. The first, **Reduction of azo compounds,** the second, **Reduction of nitro compounds.** The first uses a mixture of the azo-compound and tin in an electrolytic cell, the second a mixture of the nitro-compound with copper in the same way.

700,673. Max Buchner, Mannheim, Germany. **Ceramic products.** Made from two parts corundum powder, one part levigated kaolin and water, molding, drying, and firing the mass.

MAY 27, 1902.

700,793. Henry A. Mann, Troy, N. Y., assignor to Antiaqua Co., Albany, N. Y. **Waterproofing** starch-finished goods by forcing into them a solution of pyroxylin in amyl acetate or similar solvent.

700.884–5. Ernst Zuhl, Berlin, Germany. **Pyroxylin compound.** Nitrocellulose, a compound ester of carbon dioxide, and an oxygenated hydrocarbon of the aromatic series as diphenyl carbonate, etc. In the second patent the compound esters of phosphoric acid are substituted for esters of carbon dioxide.

700,888. Timoleone Batistini, Genoa, Italy. Fluid for **promoting combustion.** Sodium nitrate 1, sodium carbonate 2 parts in solution. Furnishes oxygen and retards escape of volatile carbon.

700,941. Nathaniel S. Keith, Arlington, N. J. **Treating copper ores.** Passes a solution of the metal through two or more cells as electrolyte, the cells connected in series, the anodes insoluble, the electrodes of each cell in electrical multiple, with gradually increasing surfaces, whereby there is a reduction of current density as the metal is deposited.

700,967. John D. Moore, New York, and Fred. D. Martin, Brooklyn, N. Y. Method of **extinguishing fires.** Confines cotton bales, etc., in air-tight compartments and pumps in under pressure a gas that is a non-supporter of combustion.

700,979. Charles Pangborn, Kalamazoo, Mich. **Flux for welding metals.** Boracic acid 15, iron filings 85, gelatin $\frac{1}{8}$, and water $2\frac{1}{4}$ parts, by weight.

701,002. Joseph B. de Alzugaray, London, England. **Extracting precious metals.** Mixes pulverized ore with sodium chloride, sodium carbonate, and potassium cyanide, forces through the mass a gaseous mixture of bromine and air, and recovers the metals by electrolysis or otherwise.

WM. H. SEAMAN.

Digitized by Google

REVIEW OF AMERICAN CHEMICAL RESEARCH.

VOL. VIII. NO. 12.

WILLIAM A. NOYES, Editor.

REVIEWERS:

M. T. Bogert, E. M. Chamot, B. S. Cushman,
Benton Dales, L. M. Dennis, A. H. Gill,
H. M. Goodwin, W. F. Hillebrand, L. P. Kinnicutt,
H. W. Lawson, H. N. McCoy, A. A. Noyes,
J. W. Richards, S. P. Sadtler, J. O. Schlotterbeck,
W. H. Seaman, F. P. Underhill.

INORGANIC CHEMISTRY.

Researches on the Oxides of Tungsten. BY E. T. ALLEN AND V. H. GOTTSCHALK. *Am. Chem. J.*, 27, 328–340.—Tungstic acid is reduced by stannous chloride or hydriodic acid to a hydrated oxide of the composition $W_5O_{14}.H_2O$, an insoluble, indigo-blue powder which is easily oxidized by the air and other oxidizing agents. It dissolves in hot caustic alkalies forming tungstates, with evolution of hydrogen. Aqueous ammonia converts it into ammonium tungstate and a bronze-colored oxide, $W_2O_5.H_2O$. Sodium tungstate and hydroxylamine hydrochloride give $4NH_2OH.3WO_3.3H_2O$, a white precipitate. H. N. McCOY.

The Action of Fused Sodium Dioxide on Metals. BY WM. L. DUDLEY. *Am. Chem. J.*, 28, 59–66 (second paper—first paper, This Journal, 18, 901).—Nickel, iron, silver, gold, and platinum, when heated with fused sodium peroxide to redness, are all rapidly attacked. Nickel gives $Ni_3O_4.2H_2O$. At 240° this gives Ni_3O_4. Iron gives $Fe_2O_3.H_2O$, brown magnetic crystals. These lose water at a red heat, leaving ferric oxide. Gold is rapidly converted into a metallic sponge, apparently owing to oxidation and subsequent decomposition of the oxide. Silver gives needle-shaped crystals, having the composition Ag_8O. They may be a mixture of Ag_2O and silver. A mixture of platinum sponge and sodium peroxide burns like tinder. Yellow insoluble $Pt_2O_3.2H_2O$ results. This gives the oxide at 450° and metallic platinum at a red heat. Pt_2O_3 is a dark brown powder. H. N. McCOY.

A Chemical Method for Obtaining Vacua. BY FRANCIS G. BENEDICT AND CHARLOTTE R. MANNING. *Am. Chem. J.*, 27, 340–345.—A few cubic centimeters of anhydrous ether are placed on the bottom of a Hempel desiccator charged with pure concentrated sulphuric acid. The air is then exhausted by

Digitized by Google

means of a pump capable of giving a vacuum of 40 to 60 mm. of mercury. The ether evaporates and drives out the air and is in turn absorbed by the acid. A vacuum of from 4 to 1 mm. results in ten minutes. H. N. McCoy.

New Oven Heated by the Oxyhydrogen Blowpipe and the Circumstances that Led to Its Construction. By Henri Moissan. *Sci. Am. Sup.*, 53, 21,878.—The crucible containing the metal is placed in the middle of a cylindrical enclosure. Over it is a dome having an opening for the passage of the products of combustion. The cylinder and the dome rest on a disk through the middle of which passes the point of the blowpipe with easy friction. In order that the hot gases may surround the crucible, this is supported by the edges of the small prisms. The furnace and crucible are made of quicklime, or preferably of hydraulic lime. For melting substances which attack lime a graphite crucible is placed inside the lime crucible. The furnace is 12 cm. in exterior diameter and 14 cm. high. The lime crucible is $3^1/_2$ cm. in diameter and 4 cm. high. A temperature of 1800° C. is attained.
H. N. McCoy.

MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

Tests for Gold and Silver in Shales from Western Kansas. By Waldemar Lindgren. *U. S. Geol. Survey, Bull. No. 202.* 21 pp.—The work described in this Bulletin was undertaken because of the persistent claims for a number of years past that both gold and silver exist in paying quantities in certain shales of Western Kansas, on the strength of which companies have been formed and their shares advertised for sale throughout the eastern states. Claims of as much as $10 to the ton are boldly made. After a brief description of the geological occurrence, follows an account of the manner of collecting samples—mainly from Ellis County, near the dividing line with Trego County—of the preparation of 19 of them for assay, and of the method of assay itself. Assays were made of all the 19 samples by Dr. Lindgren himself and Dr. E. T. Allen, of the U. S. Geological Survey, each working independently, and then a third series was made by them jointly. Details are given of the precautions taken to exclude error, and the results are, in the reviewer's opinion, worthy of the fullest trust. The reviewer deems it proper to add from his own knowledge that the furnaces and entire assay outfit were new and had been in use but a few times. Except in the third series no gold was found in any sample, and then only a value of 10 cents or 0.005 oz. per ton in one sample, and a trace in a second. Silver was found in a majority of the samples, but never quite to the extent of 0.1 oz. per ton. Seven of these

Digitized by Google

samples were then assayed by Mr. W. F. Bowen, acting assayer of the mint bureau, and seven others by Mr. Jacob Eckfeldt, assayer of the mint in Philadelphia. These gentlemen found, in most cases, considerably more silver than did Drs. Lindgren and Allen, but not exceeding 0.5 oz. per ton, and that in but one instance. They likewise found more gold in a few samples. The combined value of both gold and silver reached $1 per ton in but a single instance, and half a dollar in only one other. The author concludes as follows: "The results indicate that minute quantities of silver are often contained in these shales, and that some samples show the presence of very small quantities of gold. The same samples do not always give the same results when repeated, which goes to confirm the statement on page 5, that the metals, when present, are somewhat unevenly distributed through the rock. None of the samples contain silver or gold in economically important quantities. While, of course, it is impossible to say what may be contained in those parts of the shale beds which have not been assayed, it is extremely improbable that this material will ever be of economic importance as a silver or gold ore."

Since statements have been made that these shales contain also from 2 to 20 per cent. of zinc, three of the samples that had been tested for gold and silver—those from the quarry pits of Miller's, Gage's and the Pioneer Company's mills—were tested by Dr. Allen for both zinc and copper, but with absolutely negative results. W. F. HILLEBRAND.

On Corundum and a Graphitic Essonite from Barkhamsted, Connecticut. By B. K. EMERSON. *Am. J. Sci.*, 14, 234–236. W. F. HILLEBRAND.

Structural Details in the Green Mountain Region and in Eastern New York. By T. NELSON DALE. *U. S. Geol. Survey, Bull. No. 195.* 22 pp.—Contains an analysis by George Steiger of a dolomite from Green Peak Quarries, in Dorset, Vermont. W. F. HILLEBRAND.

A Contribution to the Petrography of the John Day Basin. By FRANK C. CALKINS. *Bull. Dept. Geol. Univ. of California, Vol. 3*, pp. 109–172.—The rocks of this region, which is in northern central Oregon, are very fully described. They "are all derived from what Rosenbusch calls the gabbro-peridotite and granito-diorite magmas. Rocks allied to nepheline syenite are quite unrepresented." The molecular preponderance of soda over potash is also regarded as significant. Anorthoclase-bearing rhyolites of similar type recurring in Eocene, Miocene, and Pliocene times indicate a certain persistency of petrographical character. The various rocks are tabulated, in order to trace, if

Digitized by Google

possible, a definite law of succession. "The general order seems to afford a fairly strong confirmation of Iddings' theory that the normal succession is from intermediate to more basic and more acid types." The five analyses by the author follow:

	a.	*b.*	*c.*	*d.*	*e.*
SiO_2	57.49	59.61	75.40	68.22	66.64
Al_2O_3	17.22	15.98	13.56	12.41	13.93
Fe_2O_3	4.34	1.12	0.21	1.00	0.95
FeO	3.01	5.42	0.61[1]	1.36	1.46
MgO	3.38	5.04	0.07	0.18	1.14
CaO	6.48	5.54	0.38	0.95	2.61
Na_2O	3.90	3.68	4.64	3.38	5.66
K_2O	1.30	1.10	4.40	3.97	2.64
H_2O at 110°	0.62	0.20	0.44	3.42	1.19
H_2O above 110°	1.37	1.14	0.94	4.82	3.81
TiO_2	1.12	0.65	0.04	0.34	0.18
P_2O_5	0.28	0.14	0.09	0.11	0.12
MnO	0.22	0.21	tr.	not det.	not det.
NiO	....	0.05	....	....	....
SrO	....	tr?	....	....	....
BaO	tr.	0.04	....	....	....
Total	100.73	99.92	100.78	100.16	100.33

a. Hypersthene andesite, Hald's Cañon. *b.* Basalt, Cherry Creek. *c.* Rhyolite, Antelope Valley. *d.* Rhyolitic tuff, Belshaw's Ranch. *e.* Recent ash, John Day Basin.

W. F. HILLEBRAND.

Bibliography and Index of North American Geology, Paleontology, Petrology, and Mineralogy for the Year 1901. By FRED BOUGHTON WEEKS. *U. S. Geol. Survey Bull. No. 203.* 144 pp. W. F. HILLEBRAND.

The Phosphate Rocks of Arkansas. By J. C. BRANNER AND J. F. NEWSOM. *Ark. Agr. Expt. Sta. Bull. No. 74.* pp. 57–123.—This bulletin presents "all that is now known of the character and distribution of phosphate rocks in the state" and is issued largely for the purpose of encouraging the development of the deposits. The different beds, the most important of which occur in North Arkansas, are described and analyses of 85 samples of the rock made by different analysts are included. While the presence of considerable iron and alumina in most cases, as shown by these analyses, may interfere with the manufacture of high-grade fertilizers, special attention is called to the point that all of the rocks may be used directly for fertilizing purposes.

H. W. LAWSON.

METALLURGICAL CHEMISTRY.

Census Report on Iron and Steel. *Iron Age*, August 28, 1902.—A long summary (five pages) of this very comprehensive

[1] Probably high.

Digitized by Google

report, which will repay reading even if the original report is accessible, as it brings out the main features of the report very clearly. J. W. RICHARDS.

Moisture in Lake Superior Iron Ores. BY N. P. HULST. *Iron Age*, August 28, 1902.—An estimate of the cost of drying these ores before shipment, and comparison with the freight charge on the moisture. The conclusions are that the saving in freight would be 10 to 14 cents per ton, the cost of drying $6^1/_2$ cents per ton, and the net saving 4 to $7^3/_4$ cents per ton, which on the $20^1/_2$ millon tons mined yearly, represents $820,000 to $1,500,000 of possible saving. The details are interesting reading.
J. W. RICHARDS.

Briquetting Fine Iron Ores and Flue Dusts. BY W. G. IRWIN. *Age of Steel*, August 16, 1902.—To-day the supply of lump ore is insufficient for the great furnaces of the Central States. In a modern furnace there are 40 to 50 tons of fine ores blown over as flue dust per day. Briquetting has therefore been extensively adopted, using either disk or plunger machines. Great compressive force makes the briquettes perfectly solid, and obviates their crushing in the furnace. The cost of briquetting, including interest, depreciation of plant, labor, lime for bonding, waste, fuel and drying is about $1 per ton, averaging on White machines $0.80. By this briquetting of fine ores, the furnace output can be increased 10 per cent., the danger of explosions removed or reduced to a minimum, and the damage caused by escaping flue-dust largely remedied. J. W. RICHARDS.

The Colorado Fuel and Iron Company. *Iron Age*, August 16, 1902.—An extensive, well-illustrated description of the recent additions and improvements to the Minnequa Works at Pueblo. Views and details are given concerning the blast-furnace plant, system of stock handling, bins, automatic hoist, furnace stack, hot-blast stoves, boilers and blowing-engines, Bessemer department, rail mill, soaking pits, blooming mill, open-hearth plant, merchant mill, hoop and cotton-tie mill, rod mill, tin-plate department, wire mill, and the pumping plant. The article will be highly interesting to all concerned in the metallurgy of iron and steel. J. W. RICHARDS.

Modern Developments in the Production of Open-Hearth Steel. BY JAMES CHRISTIE. *Iron Age*, August 7, 1902.—(Paper read before the Eng. Club of Philadelphia.) A very readable and well-considered account of the modern methods of working the open-hearth process, describing specifically the Bertrand-Thiel, Talbot and Monell processes.
J. W. RICHARDS.

Digitized by Google

Production of Manganese. *Age of Steel*, August 2, 1902.—From advance bulletin of U. S. Geological Survey. The production of ore in the United States in 1901, was 11,995 long tons, valued at $116,722. Virginia produces most, Georgia is second, and Utah third. In 1901, the imports were 165,722 long tons, from Brazil, Russia, Cuba, Turkey, Chili and India, in the order named. The production for 1901 in other countries is estimated as (in tons): Russia (mostly from the Caucasus), 646,582; India, 130,670; Brazil, 95,710; Spain, 90,224; Germany, 58,269; Turkey, 38,100; Chili, 31,477; Cuba, 25,183.

J. W. RICHARDS.

The Electrical Reduction of Lead. BY P. G. SALOM. *Trans. Am. El. Chem. Soc.*, Vol. I, 1902.—Description of the reduction of galena to spongy lead, at the works of the Electrical Lead Reduction Company, at Niagara Falls. The galena is made the cathode, in a dilute solution of sulphuric acid, and is reduced with evolution of hydrogen sulphide. A current of 1 ampere per pound of galena is used, with a voltage of 2.5, of which 1.87 is used in the chemical decomposition. It requires $^1/_2$ an electrical horse-power, costing $^1/_{12}$ cent to produce 1 pound of lead. The perfection of reduction is 95 per cent. The sponge is washed and converted into litharge; when free enough from undecomposed sulphide it can be used for storage battery plates. The works is producing nearly a ton of sponge a day, and is being enlarged. The discussion brought out many interesting points, and accompanies the paper. J. W. RICHARDS.

A Method of Electrolytic Production of Zinc from Its Ores. BY S. S. SADTLER. *Trans. Am. El. Chem. Soc.*, Vol. I, 1902.—Sodium hypochlorite is run into the leaching vats containing the pulverized blende. (The solution is made by passing chlorine gas into 40 per cent. caustic soda solution until half the caustic is converted.) After acting on the ore, the solution goes to settling tanks in which the sulphur is deposited, and thence to the cathode compartments of electrolytic cells, then to the anode side of the cells, and thence back to the ore vats. With a current of 50 amperes per square meter, 2.5 volts are needed per cell. The diaphragm is of prepared aluminum silicate. In this way, the zinc is deposited in good condition from the solution rich in zinc, while the solution is finally recharged with chlorine before escaping from the apparatus. J. W. RICHARDS.

Electrolytic Refining of Composite Metals. BY TITUS ULKE. *Trans. Am. El. Chem. Soc.*, Vol. I, 1902.—A discussion of the refining of copper-nickel alloys and mattes, and description of the author's process. He prefers to treat material with not over 20 per cent. of nickel and not less than 80 per cent. of copper. This is cast into anodes, used in a solution of sulphate of copper

Digitized by Google

and nickel, with sheet copper cathodes. This deposits pure copper, while the electrolyte tends to become richer in nickel, dissolved also from the anode. To avoid this enrichment, which would result in deposition of nickel also, after a certain point had been reached, part of this solution is periodically withdrawn, and replaced by sufficient acid copper sulphate solution to restore the electrolyte to its original composition. The solution withdrawn has ammonium sulphate added to it, and the double salt with nickel crystallized out; the copper sulphate remaining is acidified and returned to the electrolyte as above mentioned. The ammoniacal nickel salt is redissolved in hot water and electrolyzed between lead anodes and nickel cathodes. This electrolyte becomes enriched in ammonium sulphate, so that part of it is periodically withdrawn, replaced by water, the nickel salt in it crystallized out and the ammonium sulphate recovered to be used again.

J. W. RICHARDS.

Continuous Electrolysis of Solutions of Metals. BY N. S. KEITH. *Trans. Am. El. Chem. Soc.*, Vol. I, 1902.—Discusses the extraction of copper from its ores by roasting or weathering it to sulphate, lixiviating, and electrolyzing the solution. In this electrolysis to exhaustion, the main requirement is that the density of the current should be regulated to the decreasing amount of metal in the electrolyte. This is attained by circulating the solution through a series of tanks of gradually increasing size, containing gradually increasing sized electrodes, and through all of which the one electric current is passed. The strong solution is electrolyzed with small plates at a high current density, and as the solution becomes weaker it flows into the larger tanks where the electrodes are larger and the current density less. In this way, loss of power by setting free hydrogen is largely avoided, and the process becomes more economical. Lead anodes are used.

J. W. RICHARDS.

Caustic Alkalies and Chlorine by the Dry Electrolytic Process. BY C. E. ACKER. *Trans. Am. El. Chem. Soc.*, Vol. I., 1902.—Discussion of the problem of the commercial electrolysis of fused sodium chloride, and detailed description, with illustrations, of the process as used at Niagara Falls. The salt is electrolyzed with a current of 8000 amperes and 7 volts per pot, using graphite anodes and fused lead as a cathode, the lead-sodium alloy being circulated into another part of the pot where it is decomposed by steam and the fused caustic run off. A good grade of bleaching-powder is made from the chlorine, which is sucked through flues to lime chambers. The ampere efficiency attained is 95 per cent., and 2000 horse-power is used in the 45 pots in operation. There is an interesting discussion.

J. W. RICHARDS.

Digitized by Google

ORGANIC CHEMISTRY.

On the Molecular Rearrangement of Unsymmetrical Acylthioureas and Acylpseudothioureas to Isomeric Symmetrical Derivatives. By HENRY L. WHEELER. *Am. Chem J.*, 27, 270–280.—Hugershoff has shown that by the action of acetic anhydride upon monophenylthiourea there is first produced an unstable acetyl derivative (m. p. 139°) which is changed to a stable isomer by heating. The melting-point of the latter is 171°, and it is identical with the substance obtained from acetylisothiocyanate and aniline. To the unstable compound Hugershoff assigned the formula, $C_6H_5NHCSNHCOCH_3$, while he regards the stable one as the pseudoform, $C_6H_5N{:}C(SH)NHCOCH_3$. In the present article, however, it is shown that the labile compound is the unsymmetrical acetylphenylthiourea, which undergoes a molecular rearrangement as follows: $H_2NCSN(C_6H_5)COCH_3 \rightarrowtail C_6H_5NHCSNHCOCH_3$, or $HN{:}C(SH)N(C_6H_5)COCH_3 \rightarrowtail C_6H_5N{:}C(SH)NHCOCH_3$. A similar molecular change is noted in the case of unsymmetrical acyl- and benzoylpseudothioureas; thus, by melting unsymmetrical acetylphenylpseudomethylthiourea it is changed to the stable symmetrical compound. EXPERIMENTAL PART.—*Unsymmetrical acetylphenylpseudomethylthiourea*, $CH_3CO(C_6H_5)NC(SCH_3){:}NH$. Beautiful colored prisms, m. p. 85°–86°, decomposed by alkali with production of acetanilide; by heating for several hours on the steam-bath it is changed to the symmetrical compound, $CH_3CONHC(SCH_3){:}NC_6H_5$ (m. p. 82°–83°). With dry hydrogen iodide, it forms colorless tables and prisms of the hydriodide, which are difficultly soluble in cold alcohol, readily in hot, and melt at 152°, with vigorous effervescence, to a clear red liquid. *Unsymmetrical acetylphenylthiourea and methyl iodide.*—Hugerhoff's labile derivative (m. p. 139°), in contact with methyl iodide, unites to form a substance identical with the hydriodide of unsymmetrical acetylphenylpseudomethylthiourea just mentioned. *Symmetrical acetylphenylpseudomethylthiourea and hydrogen iodide.*—By the action of dry hydrogen iodide upon the symmetrical compound, a hydriodide was obtained melting at 116° with effervescence, and which, when dissolved in dilute alkali and reprecipitated with carbon dioxide, yielded the free base again. *Symmetrical acetylphenylthiourea and methyl iodide.*—These do not react upon one another under the same conditions as the unsymmetrical derivative. *Unsymmetrical benzoylphenylpseudomethylthiourea* forms snowy needles, melting at 86°, and whose behavior with alkali resembles that of the labile acetyl derivative, the products being benzanilide and methyl thiocyanate. It is very readily changed by heating, or even by standing in cold alcoholic solution, to *symmetrical benzoylphenylpseudomethylthiourea*. The latter crystallizes in large thin plates or tables,

Digitized by Google

melting at 104°, readily soluble in alkali, and reprecipitated unchanged by carbon dioxide. *Unsymmetrical benzoylphenylpseudobenzylthiourea*, $C_6H_5CO(C_6H_5)NC(SCH_2C_6H_5):NH$ (by Dr. Treat B. Johnson), melts at 92°–92.5°, and gives benzylthiocyanate and benzanilide when treated with alkali. By the action of heat, it is transformed to the symmetrical compound, which dissolves unaltered in alkali and can be reprecipitated by the careful addition of hydrochloric acid, but redissolves in an excess of the latter. M. T. BOGERT.

The Oxygen Bases. BY JAMES LEWIS HOWE. *Am. Chem. J.*, 27, 311–320.—A review of the principal contributions upon the subject of the oxygen or oxonium bases. M. T. BOGERT.

The Composition of Petroleum. On the Hydrocarbons in Pennsylvania Petroleum with Boiling-points above 216°. BY CHARLES F. MABERY. *Proc. Am. Acad. Arts and Sci.*, 37, 565–595.—That portion of Pennsylvania petroleum which boils above 200° at the ordinary pressure was repeatedly fractioned at 50 mm. pressure, the specific gravity of the various fractions was noted, they were then washed with fuming sulphuric acid, the specific gravity again determined, and the purified fractions repeatedly distilled at 50 mm. pressure through a Hempel column, the final fractions thus obtained boiling within narrow limits. The specific gravity of these ultimate fractions was determined, and analyses made for carbon and hydrogen, the molecular weight and index of refraction determined, and in some cases a chlorine derivative was prepared and investigated. As a result of this work, the following hydrocarbons are reported in Pennsylvania petroleum: tridecane, tetradecane, pentadecane, hexadecane, heptadecane, octodecane, nonodecane, heneicosane, hydrocarbon liquid at —10° ($C_{22}H_{44}$), docosane, hydrocarbon liquid at —10° ($C_{23}H_{46}$), tricosane, hydrocarbon liquid at —10° ($C_{24}H_{48}$), tetracosane, hydrocarbon liquid at —10° ($C_{26}H_{52}$), pentacosane, hydrocarbon liquid at —10° ($C_{27}H_{53}$), hexacosane, hydrocarbon liquid at —10° ($C_{28}H_{54}$), and octocosane. *Tridecane*, $C_{13}H_{28}$, b. p. 124°–126° at 50 mm., 226° at 760 mm.; sp. gr. at 20° = 0.7834; index of refraction at 20° = 1.4354. *Monochlortridecane*, $C_{13}H_{27}Cl$, b. p. 135°–140° at 12 mm.; sp. gr. at 20° = 0.8973; index of refraction, 1.451. *Tetradecane*, $C_{14}H_{30}$, b. p. 142°–143° at 50 mm., 236°–238° at 760 mm.; sp. gr. at 20°, 0.7814; index of refraction, 1.4360. *Monochlortetradecane*, $C_{14}H_{29}Cl$, b. p. 150°–153° at 20 mm.; sp. gr. at 20°, 0.9185. *Dichlortetradecane*, $C_{14}H_{28}Cl_2$, b. p. 175°–180° at 17 mm.; sp. gr. at 20°, 1.032. *Pentadecane*, $C_{15}H_{32}$, b. p. 158°–159° at 50 mm., 256°–257° at 760 mm.; sp. gr. at 20°, 0.7896; index of refraction, 1.4413. *Dichlorpentadecane*, $C_{15}H_{30}Cl_2$, b. p. 175°–180° at 13 mm.; sp. gr. at 20°, 1.0045. *Hexadecane*, $C_{16}H_{34}$, b. p. 174°–175° at 50 mm., 274°–275° at 760 mm.; sp. gr. at 20°, 0.7911;

Digitized by Google

index of refraction, 1.4413. By cooling to —10°, a very small amount of a solid hydrocarbon was crystallized out from the crude hexadecane, the sp. gr. of the filtered oil being then 0.8005. *Dichlorhexadecane*, b. p. 205°–210° at 16 mm.; sp. gr. at 20°, 1.0314. *Heptadecane*, $C_{17}H_{36}$, b. p. 188°–190° at 50 mm., 288°–289° at 760 mm.; sp. gr. at 20°, 0.8000. At —10° the crude heptadecane separated a small amount of a solid hydrocarbon, melting approximately at 10°, the sp. gr. of the filtered oil being then 0.8035. *Monochlorheptadecane*, $C_{17}H_{35}Cl$, b. p. 175°–177° at 15 mm.; sp. gr. at 20°, 0.8692. *Octodecane*, $C_{18}H_{38}$. A fraction boiling mostly at 199°–200° at 50 mm. pressure, or 300°–301° at 760 mm. and showing a sp. gr., of 0.8017 at 20°, appeared to be largely octodecane, but by cooling to —10°, a solid hydrocarbon was separated which, when crystallized from ether and alcohol, and then from gasoline, melted at 20°, the yield being 20 per cent. of the original fraction. The sp. gr. of this solid *octodecane* was 0.7830 at 20°/20°, or 0.7816 at 20°/40°; index of refraction at 20°, 1.440. The oil filtered from this solid showed a sp. gr. of 0.8110 at 20°; index of refraction, 1.4435; and appeared to be a mixture of $C_{18}H_{36}$ and $C_{18}H_{34}$. *Monochloroctoaecane*, $C_{18}H_{37}Cl$, b. p. 185°–190° at 15 mm.; sp. gr. at 20°, 0.9041. *Nonodecane*, $C_{19}H_{40}$. From the fraction boiling at 210°–212° at 50 mm., there was separated a solid nonodecane, m. p. 33°–34° (from a mixture of alcohol and ether); sp. gr., 0.7725 at 30°/30°, 0.7781 at 30°/40°. The oil filtered from the solid *nonodecane* appeared to be *nonodecylene*, $C_{19}H_{38}$; sp. gr. at 20°, 0.8208; index of refraction, 1.4515. The fraction boiling at 230°–232° at 50 mm., when cooled to —10°, separated a solid *heneicosane*, $C_{21}H_{44}$, m. p. 40°–41° (from a mixture of alcohol and ether). The oil filtered from this solid showed a sp. gr. of 0.8424 at 20°, and was mainly *heneicosylene*, $C_{21}H_{42}$. From the fraction boiling at 240°–242° at 50 mm. there were separated *docosane*, $C_{22}H_{46}$, and *docosylene*, $C_{22}H_{44}$; the former as a solid, m. p. 44° (from gasoline), sp. gr. at 60°, 0.7796; the latter as a liquid, sp. gr. 0.8296 at 20°. The fraction boiling at 258°–260° at 50 mm. contained *tricosane*, $C_{23}H_{48}$, and *tricosylene*, $C_{23}H_{46}$; the former, a solid, m. p. 45° (from a mixture of alcohol and ether), sp. gr. at 60°, 0.7894 to 0.7900; the latter, an oil, sp. gr. at 20°, 0.8569; index of refraction, 1.4714. *Tetracosane*, $C_{24}H_{50}$, and *tetracosylene*, $C_{24}H_{48}$, were found in the fraction boiling at 272°–274° at 50 mm. Tetracosane melts at 48°–52°, sp. gr. at 60°, 0.7902, at 70°, 0.7893, at 80°, 0.7875, 0.7742 (referred to water at 4°). Tetracosylene is an oil, sp. gr. 0.8598 at 20°, 0.8582 at 20°/40°, 0.8375 at 60°, 0.8366 at 70°, 0.8354 at 80°; index of refraction, 1.4726. *Pentacosane*, $C_{25}H_{52}$, was separated from the fraction boiling at 280°–282° at 50 mm.; it crystallizes from a mixture of alcohol and ether in plates, melting at 53°–54°. The composition of the oily filtrate from this

Digitized by Google

solid corresponded to that of *hexacosylene*, $C_{26}H_{52}$; its sp. gr. at 20° was 0.8580, and its index of refraction 1.4725. The fraction boiling at 292°–294° at 50 mm. was found to consist of a solid *hexacosane*, $C_{26}H_{54}$, and an *oily hydrocarbon*, $C_{27}H_{52}$. Hexacosane melts at 58° when crystallized from a mixture of alcohol and ether; its sp. gr. at 60° is 0.7977, 0.7956 at 70°, 0.7943 at 80°. The sp. gr. of the liquid hydrocarbon at 20° is 0.8688, and its index of refraction 1.4722. It was quite thick and viscous. *Octocosane*, $C_{28}H_{58}$, and a *liquid hydrocarbon*, $C_{28}H_{54}$, were found in the fraction boiling at 310°–312° at 50 mm. Octocosane separates from a mixture of ether and alcohol in crystals melting at 60°; sp. gr. at 70°, 0.7945, at 80°, 0.7927, at 90°, 0.7911. The liquid hydrocarbon forms a very thick oil; sp. gr., 0.8694 at 20°; index of refraction, 1.480. The presence of the series C_nH_{2n-2} ($C_{27}H_{52}$ and $C_{28}H_{54}$) in Pennsylvania petroleum indicates a relationship with the oils from Canada, Ohio, California and Texas, the less volatile portions of which contain this same series and others still poorer in hydrogen. M. T. BOGERT.

The Composition of Petroleum. On the Hydrocarbons in Pennsylvania Petroleum with Boiling-points above 216°. BY CHARLES F. MABERY. *Am: Chem. J.*, **28**, 165–198.—A re-publication of the article reviewed above. M. T. BOGERT.

An Investigation of the Fatty Oil Contained in the Seeds of Lindera Benzoin. BY CHARLES E. CASPARI. *Am. Chem. J.*, **27**, 291–303.—The oil from the bark and twigs of Lindera benzoin possesses the odor of wintergreen, boils at 170°–300°, shows a sp. gr. of 0.923, and contains 9 to 10 per cent. of methyl salicylate. The leaves contain about 0.3 per cent. of an oil having the odor of lavender and a specific gravity of 0.888. The oil from the berries contains approximately 4 per cent. of an oil with a camphoraceous odor, boiling at 160°–270°, and with a sp. gr. of 0.850 to 0.855. Only the oil from the berries was investigated. The kernels of the seeds contain about 58 per cent. of oil, a very small portion of which is volatile with steam and contains all the odorous matter of the oil. The volatile portion was not obtained in sufficient amount for further study. The non-volatile portion forms a solid yellow fat of crystalline structure, melting at 26°. It is very soluble in ethyl alcohol, benzene, gasoline and acetone, more difficultly so in anhydrous methyl alcohol. Its alcoholic solution reacts neutral to litmus. The results of the investigation show that this fatty oil is composed of a mixture of the glycerides of *capric*, *lauric*, and *oleic* acids, the lauric acid being present in the largest amount. M. T. BOGERT.

Lauric Acid and Some of Its Derivatives. BY CHARLES E. CASPARI. *Am. Chem. J.*, **27**, 303–311.—Of the sources of lauric

Digitized by Google

acid thus far discovered, the seeds of Lindera benzoin yield it most abundantly and with comparatively little difficulty (see the preceding review). Pure *lauric acid* melts at 42° and boils at 166° under a pressure of 10–11 mm. It is very soluble in alcohol, from which it crystallizes in warty crystals of satiny luster. It is nearly insoluble in water. Its alcoholic solution reddens blue litmus. *Lauryl chloride* boils at 145° at 18 mm., and does not solidify at — 17°. It is decomposed slowly by the moisture of the air, and very quickly by alcohol. *Lauramide* crystallizes from 50 per cent. alcohol in fine, white, feathery needles, very fluffy and with the luster of satin. It melts sharply at 98°–99°, and is insoluble in water. *Lauranilide* crystallizes from 50 per cent. alcohol in long, feathery, fluffy, white needles, like fine shredded asbestos. It melts at 76.5°. *Laurotoluide* forms very fine, white, light needles, melting at 81.5°, insoluble in water, readily soluble in alcohol *Barium laurate* crystallizes from alcohol in rosettes of very fine white needles of nacreous luster. It is very difficultly soluble in water or alcohol, and does not melt at 260°. *Strontium laurate* crystallizes from alcohol in clusters of fine, white needles, which are very difficultly soluble in water or alcohol, and which decompose without melting at about 240°. The crystals contain one molecule of water. *Calcium laurate* is much more soluble in alcohol than the barium or strontium salts. It crystallizes in very short, delicate, white needles of microscopic size, containing one molecule of water of crystallization, and melting at 182°–183°. The crystals are efflorescent. *Acid magnesium laurate* is very easily soluble, and crystallizes from 50 per cent. alcohol in very fine, white needles, melting at 74°–75°. It is apparently identical with the salt described by Oudemans (*J. prakt. Chem.*, **89**, 206) as the normal magnesium laurate. The author found it impossible to prepare the normal magnesium salt. *Zinc laurate* is moderately soluble in alcohol, and crystallizes in rosettes of delicate white needles of pearly luster, containing no water of crystallization, and melting at 127°. *Copper laurate* forms a light bluish-green, microcrystalline powder, insoluble in water and very difficultly soluble in alcohol. When heated, it gradually turns darker, finally becoming dark green. It does not melt at 220°. *Lead laurate* is insoluble in water, but crystallizes from alcohol in delicate, white needles of pearly luster, melting at 101°. *Manganese laurate* is insoluble in water, but soluble in alcohol. It forms a pale pink, microcrystalline powder, m. p. 76°, and contains no water of crystallization. *Cobalt laurate* forms delicate, pale red needles, m. p. 52°, which turn dark violet when fused. It is insoluble in water, but quite soluble in alcohol. The crystals contain one molecule of water.

M. T. BOGERT.

Digitized by Google

Some Thermal Properties of Naphthas and Kerosenes. By A. H. GILL AND H. R. HEALEY. *Tech. Quar.*, 15, 74–81.—The substances examined were 76° and 62° Bé. naphthas and 135° and 150° F. fire-test kerosenes. The specific heats were determined by Regnault's method using brass, the specific heat of which had been accurately determined. The heats of combustion were found by burning the compounds in a "Primus" torch in the Junkers' calorimeter. To characterize the naphthas and kerosenes, the specific gravities, vapor densities and distillation tests were made.

The results were as follows:

Sample.	Sp. ht. 20°–30° C.	Cal. power. Cal. per gram.	Sp. gr.	Vap. dens.
76° naphtha	0.5555	10.04	0.678	44.9
62° naphtha	0.5045	9.92	0.733	56.0
135° F. kerosene	0.4961	9.59	0.786	...
150° F. kerosene	0.4912	10.10	0.788	...

A. H. GILL.

BIOLOGICAL CHEMISTRY.

The Action of Alcohol on Muscle. By FREDERIC S. LEE AND WILLIAM SALANT. *Am. J. Physiol.*, 8, 61–75.—The experiments were made upon frog's muscle exclusively, and the method employed was to ligate one leg and then to inject the solution either into the dorsal lymph sac or into the stomach. The non-alcoholized leg was then removed and its gastrocnemius muscle prepared and stimulated by electricity. In a similar manner the alcoholized leg was also treated. In small quantities ethyl alcohol does not appear to exert any action on frog's muscle. In medium quantity it exerts a favorable action, which is characterized by a quickening of the contractions; a quickening of the relaxation; the power of making a larger number of contractions and of performing a larger amount of work in a given time; an increase in the working time, or, in other words, a delay of fatigue; and the power of making a larger number of contractions and of doing a greater amount of work before exhaustion sets in. This action is exerted directly on the muscle protoplasm itself, not on the intramuscular nerve tissue. In large quantity, ethyl alcohol exerts on frog's muscle an unfavorable action which is, in general, the reverse of that caused by medium quantity of the drug and is characterized by a decrease in the extent of the contractions; a decrease in the working time, or, in other words, a hastening of fatigue; the power of making a smaller number of contractions, and of doing a smaller amount of work before exhaustion sets in.

F. P. UNDERHILL.

The Identification of Human Blood. By JUSTIN D. LISLE. *N. Y. Med. J.*, 76, 456–460.—In order to detect blood, resource

Digitized by Google

must be had to the four cardinal tests, namely, the formation of haemin crystals, the spectrum of haemoglobin, the guaiacum test, and the microscopical examination of the blood corpuscles. But in order to identify the blood as human blood such blood must cause a precipitate when mixed with the serum of an animal that has been inoculated with human blood. This identification can be applied to blood that has fallen upon wood, metal or cloth, and even after months of drying. For the details of the method the original paper must be consulted.

F. P. UNDERHILL.

Problems in the Chemistry and Toxicology of Plant Substances. BY V. K. CHESNUT. *Science*, 15, 1016–1029.—This article is a review of the facts known to-day regarding the chemistry and toxicology of plant substances, among which are the glucosides, the amaroids, the alkaloids, the enzymes, etc. The theoretical as well as the practical side of the subject is considered and several problems likely to lead to satisfactory results are also suggested.

F. P. UNDERHILL.

Physiology of Sea-Water. BY RODNEY H. STONE. *Science*, 15, 433.—In a synthetic solution prepared in such a way as to contain the six chief substances found in sea-water, it has been demonstrated that certain marine algae will not only live but can be kept for longer or shorter periods of time, and often carry out a considerable part of their development.

F. P. UNDERHILL.

The Nucleic Acid of the Wheat Embryo. BY THOMAS B. OSBORNE AND ISAAC F. HARRIS. *Ztschr. physiol. Chem.*, 36, 85–134 (See also 25th Report Conn. Agr. Expt. Sta., 1901, 365–431).—The embryo of wheat contains a relatively considerable quantity of nucleic acid, for which the name tritico-nucleic acid is proposed. About 3.5 per cent. of the commercial embryo meal used in this investigation probably consisted of tritico-nucleic acid. On keeping, the meal undergoes a change so that the unaltered nucleic acid is obtained from it in diminished quantity or not at all. Tritico-nucleic acid has the properties of the true nucleic acids but is less soluble in water. Its composition corresponds to the formula $C_{41}H_{61}N_{16}P_4O_{31}$. It forms acid salts with potassium, sodium, or ammonium, which are readily soluble in water with a strongly acid reaction to litmus. In consequence of this, it is impossible to make preparations of the acid wholly free from base. The lack of agreement between the analyses of nucleic acid, heretofore published, is largely due to this fact. On hydrolysis with acids, tritico-nucleic acid yields 1 molecule of guanine, 1 of adenine, 2 of uracyl, and three of pentose, for every four atoms of phosphorus, and also an unidentified

Digitized by Google

basic body. Silver tritico-nucleotinate contains six atoms of silver for every four of phosphorus, from which the free acid is supposed to contain six hydroxyl groups. The constitution of tritico-nucleic acid may be represented by the union of four $P(OH)_5$ groups in which the four atoms of phosphorus are united by three of oxygen, and all but six of the remaining fourteen hydroxyls are substituted by the groups named, thus forming a complicated ester of penta-hydroxyl phosphoric acid, an acid unknown in the free state, but which Stokes has shown forms stable esters. By a brief hydrolysis with dilute acids, all the guanin and adenin are split off and, at the same time, about one-fourth of the phosphorus appears as orthophosphoric acid. By dilute alkalies, the purin bases are not easily split off, but orthophosphoric acid is rapidly and abundantly formed. After a brief hydrolysis, in acid solution, a complicated phosphoric acid remains which contains no guanine or adenine and only two pentose groups for every three atoms of phosphorus. The composition of its barium salt indicates that it may be formed from the nucleic acid by splitting off one of the phosphorus atoms, to which are attached guanine and adenine. Tritico-nucleic acid resembles the nucleic acids of animal origin, in that it contains the purin, pyrimidine and carbohydrate groups, together with phosphorus. The purin groups are the same in the animal and vegetable acids, but in the former the pyrimidine and carbohydrate groups are represented by thymine and hexose, in the latter by uracyl and pentose. Tritico-nucleic acid closely resembles, and may be identified with, the nucleic acid of yeast, since both contain uracyl and pentose, and appear to have the same ultimate composition. Tritico-nucleic acid resembles guanylic acid, in that both may be represented as complicated esters of a phosphoric acid formed by the union of four $P(OH)_5$ groups, but otherwise they present marked differences, which indicate different physiological relations. The conception of tritico-nucleic acid as an ester of penta-hydroxyl phosphoric acid suggests a chemical relation that may exist between paranucleic acid and the true nucleic acids. The protein compounds of nucleic acid may be regarded as protein nucleates, those containing but little nucleic acid united with much protein forming the nucleoproteids, those with much nucleic acid and little protein forming the nucleins. The proportion in which the protein and nucleic acid unite is determined by the relative proportion of bases and acids present in the solution at any given time. F. P. UNDERHILL.

On Lecithin, Cephalin, and Cerebrin from Nerve Substance. BY WALDEMAR KOCH. *Ztschr. physiol. Chem.*, 36, 134–140.—For the preparation of these substances the following method was employed: One kilo of finely hashed sheep's brain was freed from water and extractives by boiling eight hours with one kilo

Digitized by Google

of acetone. After filtration in the cold, the residue was freed from acetone by gentle heating, and extracted twice with 700 cubic centimeters of cold ether, each extraction lasting three days; the filtrates were united and allowed to slowly evaporate until one-fourth its original volume. Before this point was reached a fine white precipitate (probably protagon) separated, and the fluid was drawn from it with a pipette. The addition of 1.5 kilos of alcohol to this ethereal solution gave a white precipitate of cephalin, which, by further treatment with alcohol, ether and acetone, was obtained pure. The alcohol-ether solution from which the cephalin had been precipitated was evaporated. The residue was dissolved in ether and freed from cholesterin by acetone, the lecithin was dissolved in alcohol (cold) and the filtered solution evaporated. If the lecithin so obtained be dissolved in ether, it may be purified by recrystallization in acetic ether. For the preparation of cerebrin, the residue remaining after extraction of the above substances was boiled with alcohol. The precipitate which formed at 0° C. was purified by treatment with glacial acetic acid. The substances so obtained gave, on ultimate analysis, compositions agreeing very closely to those obtained by other investigators. F. P. UNDERHILL.

AGRICULTURAL CHEMISTRY.

CONVENTION OF ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS.

The nineteenth annual convention of the Association of Official Agricultural Chemists was held at Columbian University, Washington, D. C., October 2–4, 1902, and was presided over by the president, H. J. Wheeler, of Rhode Island.

The referees were all present and submitted reports. Seven additional papers were read. Neither the reports nor papers were discussed at any great length and very few matters of importance were acted upon.

During the course of the meetings the Secretary of Agriculture addressed the association upon several lines of investigation being conducted in his department. President Needham and Professor Munroe, of Columbian University, were also present upon invitation and extended the greetings of the university, congratulating the association upon its work.

The officers elected for the coming year are as follows: *President*, R. J. Davidson, Blacksburg, Va.; *Vice-President*, M. E. Jaffa, Berkeley, Cal.; *Secretary*, H. W. Wiley, Washington, D. C.; *Additional Members of Executive Committee*, C. L. Penny, Newark, Del., and A. E. Leach, Boston, Mass.

The referees are: *Phosphoric Acid*, B. H. Hite, Morgantown,

Digitized by Google

W. Va.; *Nitrogen*, F. W. Morse, Durham, N. H. (determination); L. L. Van Slyke, Geneva, N. Y. (cheese proteids); R. Harcourt, Canada (vegetable proteids); W. D. Bigelow, Washington, D. C. (meat proteids); *Potash*, H. D. Haskins, Amherst, Mass.; *Soils*, F. P. Veitch, Washington, D. C.; *Dairy Products*, G. W. Cavanaugh, Ithaca, N. Y.; *Foods and Feeding Stuffs*, F. D. Fuller, Geneva, N. Y.; *Food Adulteration*, W. D. Bigelow, Washington, D. C.; *Sugar*, G. L. Spencer, Washington, D. C.; *Tannin*, G. A. Kerr, Damascus, Va.; *Insecticides*, J. K. Haywood, Washington, D. C.; *Ash*, E. G. Runyan, Washington, D. C.

A summary of the more important points in the reports, papers, and discussions on the subjects under investigation by the association follows:

Phosphoric Acid, C. H. Jones, referee.—The availability of phosphoric acid in basic slag was determined by different methods. The ammonium citrate method gave the lowest results and the Macfarlane method the highest results, the determinations ranging from 4.54 to 10.90 per cent.

Potash, H. B. McDonnell, referee.—Results from fourteen analysts showed quite concordant results in the determination of potash by the Lindo-Gladding and milk-of-lime methods and a method proposed by the referee. The methods failed to recover about 7 per cent. of the total amount of potash present in mixed fertilizers. Determinations of the moisture in potash salts were also reported. The referee recommended further work on methods for dissolving the potash in mixed fertilizers and for determining the moisture in potash salts, which was approved by the association.

A paper by C. L. Hare on the "Determination of Potash in Fertilizers by the Substitution of Milk of-Lime for Ammonia and Ammonium Oxalate as the Precipitant," was read by B. B. Ross. The advantages of the milk-of-lime method were pointed out and the results of a large number of comparisons of the milk-of-lime and Lindo Gladding methods were given. On fertilizers containing no organic materials the methods compared well. On fertilizers containing organic matter ignition with sulphuric acid of the samples for the milk-of-lime method was necessary for satisfactory results.

Determination of Nitrogen, F. W. Morse, referee.—Comparisons by twelve analysts of the neutral permanganate method as modified by Street, and the alkaline permanganate method as modified by Jones for the determination of available organic nitrogen on dried blood and cottonseed-meal combined with superphosphate gave widely varying results and neither method was thought to give the available nitrogen. A further study of the two methods was recommended. In reporting analyses of mixed fertilizers it was recommended that the amounts of nitro-

Digitized by Google

gen existing in the form of nitrates, organic nitrogen, and ammonium salts be so stated.

In the determination of nitrogen, G. W. Cavanaugh favored the use of both mercuric oxide and potassium sulphate, and also the addition of sodium hydroxide previous to the addition of potassium sulphide in order to avoid the liberation of hydrogen sulphide. He also advised distillation with steam.

Separation of Nitrogenous Bodies, L. L. Van Slyke, referee.—Methods for the separation and determination of the proteolytic products of cheese and milk were devised and subjected to extensive tests by the referee in collaboration with E. B. Hart. The methods and results were given in detail. The work for the coming year will include also meat and vegetable proteids and will be divided among three referees.

Soils, F. P. Veitch, referee.—Determinations of available phosphoric acid and potash in eight soils having a full crop and fertilizer history for a number of years were made by the referee and C. C. Moore with the N-200 hydrochloric acid method. The results showed sufficient harmony with crop history to warrant further trial of the method. Methods for the analysis of alkali soils were also studied with particular reference to the solution of the salts and to titration methods for the determination of carbonates, bicarbonates, and chlorides. The referee included in his report a letter from Milton Whitney, Chief of the Bureau of Soils, dealing with the value and methods of mechanical analysis and the work of the bureau in the classification of soils based upon physical examination. Professor Whitney pointed out the advantages of adopting the grades already in use by the bureau, namely, fine gravel, coarse sand, medium sand, fine sand, very fine sand, silt, and clay, calling attention to the fact that over 3,000 analyses based upon these divisions had been published.

G. S. Fraps read a paper on "Studies in Nitrification," in which he showed variations in the rate of nitrification in soils under uniform conditions as regards moisture, temperature, and plant food, and in sterile soils supplied, respectively, with cottonseed meal and ammonium sulphate, and inoculated with different soils as they came from the field. These differences were attributed to stages in the life history of the nitrifying organisms and to variations in the organisms themselves. From the results of his work the author proposed methods for determining the relative nitrifying power of soils.

C. G. Hopkins described the method of determining the acidity of soils used at the Illinois Experiment Station, and F. P. Veitch the method used in the Bureau of Soils. H. W. Wiley discussed the influence of soil and meteorological conditions upon the yield and character of crops.

The association adopted the recommendations that the N-200

Digitized by Google

hydrochloric acid method be given further trial; that samples for the determination of available phosphoric acid and potash be taken to a greater depth than at present; that virgin soils be used in investigations; that the determinations of the acidity of soils be referred to the referee, and that methods for the analysis of alkali soils be further studied, with a view to ascertaining the most desirable amount of soil and the amount of water to be used in dissolving the soluble salts.

Dairy Products, G. W. Cavanaugh, referee.—The presence of formaldehyde in milk was found to affect very materially the determination of albumin.

Foods and Feeding Stuffs, C. A. Browne, Jr., referee.—The work consisted of determinations of moisture, fat, and pentosans in samples of timothy hay and distillers' grains according to the official methods of the association and of comparisons of the official and König methods for the determination of crude fiber. Based upon results obtained by nine analysts the referee recommended a further study of the König method with the additional treatment of the fiber with alkali as by the official method. The referee also recommended the substitution of Kröber's factors for calculating pentoses and pentosans for those given in the provisional method, which recommendation was adopted.

Food Adulteration, W. D. Bigelow, referee.—The attempt was made during the year to complete the reports on cereal products, tea and coffee, and cocoa and chocolate, the subjects not completed at the last meeting. Two of the reports were announced as ready. The work is to be further subdivided by the referee and parts assigned to associates.

Sugar, G. L. Spencer, referee.—The report of the referee outlined the experimental work of his associates, discussed special methods used in the analysis of sugar-beets and raw sugars, and recommended among other changes the substitution of the German official method for Clerget's method for determining sucrose and the adoption of the method of direct weighing of the cuprous oxide in determining reducing sugars.

L. S. Munson, associate referee on chemical methods, read a paper on "Methods for Determining Reducing Sugars," in which the results of investigations conducted with a view to simplifying methods and increasing their accuracy were reported. Direct weighing of the cuprous oxide in the reduction method was shown to be accurate. Encouraging results were obtained in experiments to devise a single copper solution for use under uniform conditions with all reducing sugars. Conditions modifying reduction were also studied.

L. M. Tolman, associate referee on optical methods, showed as the result of investigations that at ordinary temperatures inversion with hydrochloric acid in the proportions given in the Ger-

Digitized by Google

man official method gives very satisfactory results, and also that inversion with citric acid gives accurate results in the absence of acetates. The latter method was considered of value in the examination of honey.

Tannin, W. H. Teas, referee.—The work done on this subject consisted of comparisons of single and double filter-papers for the determination of soluble solids in extracts, and of the distillation, Kohnstein-Simand, and charcoal methods for the determination of acidity of liquors. The referee recommended the use of the single filter-paper.

The following method for the determination of total acidity in liquors was adopted provisionally: Place 100 cc. of the liquor in a 500 cc. flask and make up to the mark with ether. To 100 cc. of diluted liquor in a flask with tube condenser add 2 grams of chemically pure animal charcoal. Heat to boiling temperature with frequent shaking, cool, filter, and titrate an aliquot portion with decinormal alkali.

Insecticides and Fungicides, J. K. Haywood, referee.—Methods of analysis collected from various sources, and published as Circular 10 of the Bureau of Chemistry, were tested by the referee and a number of collaborators. The only method recommended for adoption was one for the determination of total arsenious oxide in Paris green (method I in the circular referred to above). Mr. Haywood also reported observations on the injurious effects of Paris green upon foliage, stating that Paris green containing from 4 to 7 per cent. of free arsenious oxide was found injurious to certain fruit trees.

Ash, G. S. Fraps, referee.—Methods for the determination of sulphur and potash in plants were tested on corn bran and cottonseed-meal with results showing no satisfactory agreement. The referee discussed the presence and determination of sulphates in plants, reviewing the literature of the subject and giving the results of tests. Three methods for the determination of chlorine were compared, namely, ignition with calcium acetate, fusion with sodium hydroxide, and ignition with sodium carbonate. The calcium acetate method gave low results. The sodium carbonate method gave as accurate results as the sodium hydroxide method, and, being shorter and easier, was recommended for adoption. The association recommended further testing of the fusion method for sulphur and an investigation of methods for the determination of the amount of sulphur in plants which belongs to the ash, and adopted provisionally the method of determining chlorine by ignition with sodium carbonate.

Food Standards, W. Frear, chairman of committee.—The work during the year consisted in formulating definitions and standards for foods. John Hamilton discussed this subject with reference to the work being done in the inspection of foods in Penn-

Digitized by Google

sylvania, urging the more extensive testing of food preservatives.
H. W. LAWSON.

Physical, Chemical, and Field Work. *Cal. Agr. Expt. Sta. Rep.*, 1898–1901, Part I, pp. 21–61.—This includes a summary of the results of analyses of waters, foods, and fertilizers made at the station during three years; a discussion of the food value of the pie melon, including analyses; a report on a test of an emergency ration marketed in the form of tablets, which showed that the ration did not supply sufficient nourishment for a healthy young man; and several papers noted below.

The Gooselands of Glenn and Colusa Counties. By R. H. LOUGHRIDGE, T. L. KNOCK, AND J. B. DAVY.—These are alkali lands comprising an area from six to fifteen miles wide and thirty miles long. The results of chemical and mechanical examinations of the soils are given, as well as notes on their origin, reclamation, and flora. Alkali salts were found present in large quantities, the principal salt being sodium sulphate.

An Investigation of Soil Sediments as Formed under Arid Conditions, with Regard to Their Plant-Food Value. By L. M. TOLMAN.—From the results of chemical analyses of sediments obtained in mechanical analyses of California soils, the author concludes that the clay of arid soils is not so important a factor in plant nourishment as that of humid soils, and that there is a rather general distribution of plant food in about the same condition through all the sediments.

Instantaneous Bleaching Liquid for Nuts.—By G. E. COLBY.—Several bleaching solutions for walnuts were tested. The following formula is suggested as being most satisfactory for commercial purposes: Sal soda, 12 pounds; chloride of lime, 12 pounds; and water, 45 gallons. To this mixture a small quantity of dilute sulphuric acid is added. The nuts are dipped for ten seconds and washed. The use of bleaching solutions is believed to be perfectly harmless. H. W. LAWSON.

Soil Analyses. By C. L. PENNY. *Del. Agr. Expt. Sta. Rep.*, 1901, pp. 77–82.—Mechanical analyses and determinations of the potash, phosphoric acid and lime in 7 samples of surface and subsoil obtained near Dover are reported. Slightly more potash was found in the subsoil than in the surface soil. The methods used in sampling the soils and in determining potash are described. Ignition of soil samples to a bright red heat more than doubled in most cases the amount of potash soluble in 20.26 per cent. hydrochloric acid (1 liter of acid to 500 grams of soil), the digestion being maintained in a rotary device at steam heat for twelve hours. H. W. LAWSON.

Sugar-Beets and Sorghum in Delaware. By A. T. NEALE AND C. L. PENNY. *Del. Agr. Expt. Sta. Rep.*, 1901, pp.

Digitized by Google

30–35, 74–77.—Four articles, noted for convenience under this heading, contain numerous analyses of sugar-beets and sorghum grown in culture experiments. H. W. LAWSON.

PATENTS.

MAY 27, 1902.

701,044. Benno Homolka, Frankfort-on-Main, and Nicholaus Schwan, Hochst-on-Main, Germany. Assignors to Farbwerke, vorm. Meister, Lucius, und Bruening, same place. **Phenylaminoacetonitrile.** Glycollic acid nitrile is caused to react on aniline bases.

701,051. Werner Kelbe, Hochst-on-Main, Germany. Assignor to Farbwerke, vorm. Meister, Lucius und Bruening, same place. **Black sulphur dye.** Halogen-substituted nitrophenols are heated with sulphur and alkaline sulphides, forming deep black powders, insoluble in water and alkali carbonates, readily soluble in alkaline sulphides, and dyeing unmordanted cotton green-black that turns deep black on treatment with copper.

701,125. Fritz Arledter, New York, and Herman Arledter, Garston, England. **Making resin size.** Mixes oil with molten resin and filters, adds an ammonium compound and an alkaline lye sufficient to produce saponification, agitates in contact with carbon dioxide under heat and pressure that allows a part only of the resin to be saponified.

701,134. Charles J. Best, Denver, Colorado. **Treating ores.** Makes a mixture of common salt 2, niter and alum 1¼ each, nitric acid 1½ parts, add this to the crushed ore with acid, boils, filters and precipitates by hydrogen sulphide, then heats the sludge and precipitates with the usual fluxes.

701,215. Ludwig Mond, London, England. Obtaining **zinc by electrolysis.** A series of revolving anodes touch each other and give a transverse rubbing action on the deposited zinc.

701,271. Charles T. Lee, Boston, Mass. Assignor to Bagasse Pulp Co., of Maine. **Making paper pulp,** by dampening fibrous material and exposing it to the action of chlorine gas.

JUNE 3, 1902.

701,298. Sherard Cowper-Cowles, London, England. Assignor to Sherardizing Syndicate, Westminster, London, England. **Depositing metals** on metallic surfaces. Applies to a metallic surface as iron, pulverulent zinc mixed with not less than 8 per cent. of zinc oxide and heats in a closed chamber in the presence of carbon.

Digitized by Google

701,352. William T. Kendrick for self and as administrator of George W. Dixon, deceased. **Making disinfectants.** Decants a solution of bleaching-powder in water, to which is added solution of sodium carbonate, made hot, allows to stand and removes supernatant solution, to which is added borax and potassium permanganate; after precipitation, the liquor is used.

701,357. Isidor Kitsee, Philadelphia, Pa. **Pyroxylon compound.** Adds a solvent to amorphous cellulose, then adds sulphur and vulcanizes by heat. The solvent may be amyl acetate.

701,378. David J. Ogilvy, Cincinnati, Ohio. **Making paint.** Steams zinc oxide or mixture thereof with a suitable vehicle at a high temperature, and then strains.

701,392. Leonard M. Randolph, Newark, N. J. **Japanning varnish.** Assignor 6–10 to B. G. Braine and L. F. Braine, Brooklyn, N. Y. Takes waste of varnish manufacture known as varnish residue, heats it and strains, then adds 25 per cent. of peat dried and powdered.

701,427. Jules Ville, Montpelier, France. **Red dye.** Heats dialkyl-*m*-amino phenol with oxidizing agent, and chloral, in the presence of sodium acetate. Bluish iridescent crystals, slightly soluble in water with orange-yellow fluorescence, and dyeing red.

701,429. Stanley L. Walter and Frederick W. Keiner, Ekastown, Pa. Process of **hardening copper.** Places aluminum and charcoal in a crucible with copper on top; on heating, carbon dioxide passes through the copper preventing oxidation, and on melting the copper sinks in the aluminum, making an intimate alloy.

701,485. Arthur Weinberg, Frankfort-on-Main, Germany. Assignor to Leopold Cassella and Co., same place. **Brown-violet sulphur dye.** Heats oxyaminophenazin with alkaline sulphides and sulphur. Dyes brown violet.

701,508. John A. Robinson, Berwing, Colo. **Boiler-cleaning compound.** Water from boiled potatoes, ammonia, sal-soda, black oil, wood ashes, sulphur, and the dung of ruminants.

701,523. Heinrich Thron, Frankfort-on-Main, Germany. Assignor to Vereinigte Chinin Fabriken, Zimmer and Co., same place. **Alkyl ethers of cinchona alkaloid carbonic acids.** Alphyl ethers of alkyl carbonic acids react on cinchona alkaloids to form cinchona alkaloid ethers of the alkyl carbonic acid.

701,556. Emil Fleischer, Dresden-Strehlen, Germany. Assignor to Edouard Goldschmidt, Frankfort-on-Main, Germany. Making **water gas.** After charging fresh bituminous coal and blowing up the fire, an excess of air is passed slowly through before steam is admitted, whereby some producer gas is made.

Digitized by Google

701,591. Carl O. Lundholm, Stevenston, Scotland. **Smokeless gunpowder.** Nitroglycerin, 30; nitrocellulose, 60; diamyl phthalate, 10; and vaseline, 5.

701,604. George Ottermann, Vienna, Austria-Hungary. **Making cyanides.** Waste nitrogenous organic substances are destructively distilled, the gases are brought in contact with heated neutral material as coke, then with hot carbonaceous matter, and finally with a hot mixture of coal and alkaline carbonates.

701,605. Carl Paal, Erlangen, Germany. Assignor to Kalle and Co., Biebrich, Germany. **Colloidal gold.** Bright scales, over 60 per cent. pure metal retaining its solubility in dilute aqueous alkalies after precipitation from water by acids. Made by dissolving albumins in warm dilute alkalies, adds caustic soda-lye 20 per cent. and as much gold chloride slightly in excess of the alkali present, heats the mixture till it turns a bright red, dialyzes it against water, precipitates with dilute acid, dissolves the precipitate in dilute caustic soda, dialyzes again, and evaporates.

701,606. **Colloidal silver,** otherwise as above. Contains 90 per cent. pure metal as bright blue scales. Heats till fully dissolved in fourth step.

701,620. Julius Rother, Katscher, Germany. **Disinfectant powders.** Mixes sublimate, 1; alsol (aluminum acetotartrate), 20; and sozoiodol-mercury, 1; and to each gram adds 0.014 gram veratrine, evaporates on water-bath to thick fluid, dries at low heat, grinds and mixes with lactose.

701,650. Douschande Vulitch and Jules d'Orlowsky, Paris, France. Making **calcium carbide.** Brings a mass of molten lime free from carbon into contact with a liquid hydrocarbon and permits the mass to cool in contact therewith.

701,707-8. Winfield H. Gibson, Homestead, and Henry Wessling, Hopechurch Pa. **Silica bricks.** Mixes pure silica coarsely ground 40 parts with 1 part of very finely powdered pure silica, dries and burns.

701,713. Frederick Greening, Plumstead Common, England. Assignor to Frederick Henry Bowden, London, England, and Sydney Herbert Dodd, Blackheath, England. **Waterproof insulating material.** Mixes anthracene and a copal resin.

701,718. Charles M. Hall, Niagara Falls, N. Y. **Paint pigment.** An easily pulverized alloy of iron, containing silicon and titanium.

701,743. Thomas L. Lee, Memphis, Tenn. **Paint.** Distilled coal tar, dead oil, refined benzin, and Chickasaw ochre.

Digitized by Google

Index to Volume XXIV, 1902.

[R preceding a number or numbers refers to the Review of American Chemical Research, Pr refers to the Proceedings.]

ABEGG, R., and G. Bodländer, electro-affinity as a basis for systematization, etc., R 446
ABEL, JOHN J., behavior of epinephrin to Fehling's solution, R 92; Simple method of preparing epinephrin....R 234
Abrasives of U. S....R 129
Acetic acid in stomach....R 29
Acetone, molecular weights in....R 264
Acetyl peroxide....R 234
Acetyl pseudothioureas....R 89
Acetylene, heat of dissociation and combustion....R 268
Acid analysis, systematic....Pr 10
Acid chlorides, action of liquid ammonia on....R 303
ACKER, C. E., caustic alkalies and chlorine by the dry electrolytic process....R 527
Acker process....R 371
ACREE, S. F., the constitution of phenylurazole....R 308
Acylamines, production of....758, 1028
Acylpseudothioureas, molecular rearrangement....R 528
Acylthioureas, molecular rearrangement....R 528
ADAMS, ALTON D., electrical incomes and outputs per ton of coal....R 99
ADAMS, C. F., gold mining in Eastern Ontario....R 217
ADAMS, E. G., JR., copper mines of Ashio, Japan....R 15
ADAMS, FRANK D., and John T. Nicholson, experimental investigation of the flow of marble....279
ADAMS, G. E., see H. J. Wheeler.
ADAMS, GEORGE I., oil and gas fields, Texas and Gulf Coast, R 151; See Joseph A. Taff.
Addition-splitting-off law....R 306
Addresses wanted....Pr 49, 53, 66, 79, 83, 89, 99
Adrenalin, R 362; glycosuria caused by, R 171, 362; In suprarenal gland....R 465
Agricultural Chemists, conventions of....R 42, 514, 536
Agriculture, in China, R 49; In its relations to bacteria, R 511; Report of the Secretary of, R 103; Yearbook of U. S. Department....R 514
Air, liquid, density and surface-tension....R 269
Air, relation between density and index of refraction....R 269
Alaska, explorations in 1898....R 78
Albumin, acid, determination in digestive mixtures, R 497; In urine, R 422; New test for....R 208
Albuminuria, cyclic....R 420
Alcohol, action on muscle, R 231, 533; nutritive value of....R 465
ALDRICH, T. B., is adrenalin the active principle of the suprarenal gland?....R 465
Alfalfa, fixation of nitrogen by, 1155; spontaneous combustion of....R 511
Alkali and alkali soils, R 101; tolerance of, by plants....R 102
Alkali deposits....R 192, 202
Alkali works, electrolytic, analyses for....469
Alkalies, caustic, Acker electrolytic process, R 371; Dry electrolytic process....R 527
Alkalimeter, new form of....391
Alkaline liquor, spent, analysis of....235
Alkaloids of Escholtzia Californica, R 31; Of Glaucium flavum, R 31; Of Sanguinaria, R 30; Of Zygadenus venenosus....R 230
Alkylketodihydroquinazolines, synthesis of....1031
ALLAN, F. B. The sulphates of bismuth....R 341
Allantoin, excretion experiments....R 231

Digitized by Google

Allegany County, Md., geology, mineral resources, soils.....R 9
ALLEN, E. T. The oxides of tungsten, Pr 50; See George Steiger.
ALLEN, E. T., and V. H. Gottschalk. Researches on the oxides of tungsten.....R 521
ALLEN, LUCIUS R. See George A. Hulett.
ALLEN, R. M. Inspection and analyses of foods.....R 515
Alloys, as solutions, R 163; Constitution of binary, R 224; Process of producing, R 221; Review of, R 461; See also the various metals.
Alumina, reduced by calcium carbide, R 159; Volumetric estimation in alums..... 457
Aluminum, alloys of, 253; Alloys with magnesium, R 221; and bauxite, R 73; At the Pan-American, R 160; Commercial importance, R 20, 302; For determining copper, 478; Generation of heat by combustion, R 419; Halide addition-products, R 359; In India, R 159; In yellow brass, R 20; New alloy, R 159; New plant, R 20; nickel alloys, R 158; Plant at Massena, N. Y., R 462; Production in U. S., R 462; Production in 1901, R 487; Vs. copper, R 86; Works at Shawinijin, Quebec.....R 86
Aluminum silver.....R 303
Alums, solubility of, as a function of two variables, R 263; Volumetric analysis of.... 457
ALVORD, JOHN W. Sewage purification plants.....R 424
ALWAY, F. J. On the nitration of benzyl chloride..... 1060
ALWAY, F. J., and M. D. Welsh. On the reduction of some aromatic nitro compounds 1052
Amandin, sulphur in..... 149
American Chemical Society, 26th General Meeting.....Pr 69
AMES, J. W. Sugar-beet investigations in 1901.....R 400
Amines, aromatic, action upon phthalyl chloride.....R 90
o-Aminobenzonitrile..... 1038
Aminomethyl phenylether..... 1202
Ammonal, a new explosive.....R 241
Ammonia, commercial aqua, 377; Liquid, action on acid chlorides and esters.....R 303
Ammonium: chloride, action of, on silicates, R 118; Sulphocyanates, action of benzoyl chloride on, R 26; Tungstates, 629; Vanadicophosphotungstate..... 573
Amendments to Constitution.....Pr 85
Amylamine, from azoxybenzene..... 1185
Analcite, in camptonite, R 454: Silver.....R 449
Analyses, miscellaneous.....R 402
Andesite from Boulder Co., Col.....R 71
ANDREWS, LAUNCELOT W. A method for the determination of very small vapor-tensions..... 864
ANDREWS, LAUNCELOT W., and Henry M. Goettsch. Contributions to study of starch iodide..... 865
ANDREWS, W. H. See L. L. Van Slyke.
Anethol, derivatives of.....331, 332, 334, 337
Ann. New York Acad. Sci., 14, part II.....R 343
Anthranilic nitrile, synthesis of alkylketodihydroquinazolines from..... 1031
Antipyrine, action of isovaleric aldehyde on..... 1050
Antimony, alloys with aluminum, 259; Alloys with tellurium, R 200; Atomic weight, 204; standard tartar emetic..... 828
Apatite, Minot, Maine.....R 285
Aplite in Georgia granite.....R 342
Apparatus, new.....Pr 10
Applied Chemistry, International Congress.....Pr 91
ARCHIBALD, R. H. See T. W. Richards.
ARGALL, P. The dry crushing of ores.....R 486
Argemone Mexicana..... 238
Argemonine..... 242
Arsenic, atomic weight, 203, 489; Determination in iron and steel, R 485; Pentachloride, 1070; Reinsch's test, 276; Retention of, by iron in Marsh-Berzelius method..... 1005
Arsenic acid, interaction with hydrogen sulphide..... 661, R 201
Arsines, primary.....R 171
ARTEAGA, JULIUS F. Phlorhizin diabetes in cats.....R 30

Digitized by Google

Artesian wells, the Muscotah....R 72
Artichokes, nitrogen-free extract matter....R 401
Artificial parthenogenesis....R 30
Asbestos, in Vermont....R 344
Ash, of plants, estimation....R 45, 138, 540
ASHLEY GEORGE S. See W. S. Blatchley.
ASHLEY, HARRISON EVERETT. See Henry Fay.
Asphalt: Deposits of the U. S., R 150; pavements in New York, R 101; paving, specifications for, R 397; rocks in Texas....R 452
Assay: Complex gold ores, R 16; Copper, 699, 1083; New York office, R 298; Office of Ontario Government, R 457; Proposed new ton....R 496
Associates elected....Pr 30, 39, 40, 45, 48, 52, 64, 74, 78, 82
Atchison diamond-drill prospect hole, the....R 72
ATKINSON, H. M. The silver mine of Texas....R 495
Atmosphere, inert constitutents of....R 3
Atomic structure, J. J. Thomson's work....R 271
Atomic volume, significance of changing, II and III....R 441
Atomic weights, calculation of, R 437; Ninth Annual Report of Committee on, 201; Tables of....213, R 437
Atropine, Action on embryos....R 92
AUBERT, A. B. A preliminary note on the oil of Milfoil, 778; Notes upon some little known oils....691
AUCHY, GEORGE. Determination of molybdenum in steel, 273; The rapid determination of carbon by combustion....1206
Available mineral plant food in soils....79
AYRES, C. H., JR. Internal resistance of galvanic cells....R 276
Azobenzene....1186
Azoxybenzene....1178

BABBITT, H. C. A rapid method for the separation of zinc, etc., from iron....1211
BABCOCK, E. J. Report of North Dakota Geological Survey....R 77
Babcock test bottles, calibration of....R 247
Bacteria, effect of electric currents on, R 132; in ice....R 177
Bacterial treatment of trade waste....R 503
BAILEY, E. H. S. Classification of mineral waters....Pr 41
BAILEY, E. H. S. Relative heating power of coal and illuminating gas....R 71
BAILEY, GILBERT E. The saline deposits of California....R 481
BAIN, H. F. Lead and zinc deposits of the Ozark region....R 206
BANCROFT, WILDER D. Analytical chemistry and the phase rule classification....R 440
BANCROFT, WILDER D. Synthetic analysis of solid phases....R 440
BARBOUR, E. H. Unpublished Nebraska meteorites....R 287
Barium, compounds, manufacture, R 369; sulphate, solubility in chlorides....R 484
BARLOW, ALFRED E. On the nepheline rocks of Ice River....R 453
BARNES, H. T., and H. L. Cooke. On the specific heat of supercooled water....R 443
BARNES, JAMES. Depression of the freezing-point in solutions of hydrochloric acid, etc., R 439; See Harry C. Jones.
BARRELL, JOSEPH. The physical effects of contact metamorphism....R 283
BARTON, G. E. A new glass of low solubility....893
BARTOW, EDWARD, and David F. McFarland. Action of liquid ammonia on esters, etc....R 303
BARWICK, THOMAS. Heating and ventilating hospitals....R 184
BASKERVILLE, CHARLES. A novel constant high temperature bath....1025
BASKERVILLE, CHARLES, and H. H. Bennett. Arsenic pentachloride....1070
Bath, novel high temperature....1025
Battery, reversible galvanic....R 190
Bauxite, arkansas deposits, R 148; Georgia deposits, R 120; Mining in Georgia, R 463; Production in 1901....R 487, 463
BEACH, S. A., and H. Hasselbring. Fertilizers for forcing lettuce....R 329
BEARDSLEY, ALLING P. See Henry L. Wheeler.

Digitized by Google

BECKER, GEO. F. Geology of the Philippine Islands ..... R 149
BECQUEREL, HENRI, and P. Curie. Physiological action of radium rays..... R 132
BEEBE, S. P. A note on the influence of heat on enzymes ..... R 420
BEISTLE, C. P. Determination of sulphur and phosphorus in plant substances, 1093; See W. Frear.
BELL, R. Dredging for fine gold in Idaho..... R 302
BELL, LOUIS. The spectrum of the enclosed arc ..... R 207
Belladonna and scopola ..... R 234
BENEDICT, FRANCIS GANO. Excretion of nitrogen during nervous excitement, R 172; The nutritive value of alcohol..... R 465
BENEDICT, FRANCIS G., and C. R. Manning. A chemical method for obtaining vacua..... R 521
BENEDICT, FRANCIS G., and John P. Schnell, body temperature variations, etc..... R 364
BENNETT, H. H. See Charles Baskerville.
BENNETT, JOHN. See Erasmus Haworth.
BENSON, GIDEON, and H. W. Hillyer. Action of benzoyl chloride on ammonium sulphocyanate ..... R 26
Benzoyl: Chloride on ammonium sulphocyanate, R 26; Peroxide, R 234; Pseudothioureas..... R 89
Benzoylacetyl peroxide..... R 310
Benzonitrile, preparation..... R 26
Benzyl chloride, nitration of..... 1060
Berberine, in Argemone Mexicana, 242; Estimation of, R 322; Gaze's, R 93; Occurrence in plants..... R 321
BERKEY, CHARLES P. Origin and distribution of Minnesota clays, R 282; Sacred Heart "Geyser Spring"..... R 151
BERTHELOT, M. New researches on neutralization of phosphoric acid..... R 68
Bertrand-Thiel process ..... R 348
BEYER, S. W. Iowa's iron mine ..... R 297
BIDDLE, H. C ..... R 70
BIGELOW, W. D., and Chace, Munson, and Tolman. Foods and food adulterants, Part X..... R 376
Bile acids, R 131; Intermediary circulation of ..... R 499
BIRKINBINE, JOHN. Iron and manganese ores, R 128; Iron ores, R 73; The production of iron ore in 1901, R 412; The Sunrise Iron Mines, Wyoming ..... R 299
Bismuth, sulphates of..... R 341
BLAIR, A. A., and P. W. Shimer. A crystalline sulphide in pig iron..... R 84
BLAKE, F. C. See J. C. Blake.
BLAKE, J. C. A mica andesite of Boulder Co., Col..... R 71
BLAKE, J. C., and F. C. Blake. The rate of hydration of metaphosphoric acid..... R 265
BLAKE, W. P. The caliche of Southern Arizona..... R 5
BLAKISTON, G. P. An improvement in crucible steel practice, R 390; A queer phenomenon in melting, R 489; The manufacture of soft-center steel ..... R 490
BLASDALE WALTER C. Mineralogy of California ..... R 125
Blast-furnaces: building in the U. S., R 413; Electrical burner for, R 83; gas engines in Austria, R 83; Modern practice, R 212; New record ..... R 153
BLATCHLEY, W. S. Oölite for Portland cement manufacture, R 8; Portland cement, R 7
BLATCHLEY, W. S., and George S. Ashley. Lakes of Northern Indiana ..... R 7
Bleaching-powder, analysis of, 474; Electrolytic manufacture ..... R 371, 395
Bleaching liquid for nuts ..... R 541
Blood, count at high altitudes, R 29; Human, identification of, R 533; Plates, R 230; Viscosity of ..... R 363
BLOUNT, BERTRAM. See W. H. Stanger.
Board of Directors..... Pr 61, 94
BODLÄNDER, G. See R. Abegg.
BOGERT MARSTON TAYLOR. Imides of succinic and glutaric acids. 20
BOGERT, MARSTON T., and W. F. Hand. The synthesis of alkylketodihydroquinazolines 1031
Boiling-point, mixtures of minimum..... 448

Digitized by Google

BOLLING, GEORGE E. Intermittent filtration of sewage at Brocton, Mass .....R 472
Bone: Albumoid in, R 232; New constituent of.....R 131
Books received (see also New Books) 200, 294
BOOTH, W. H. Burning bituminous coal.. .....R 98
Borax, S. Oregon mine ... .R 395
BOROSCHEK, LEOPOLD. See Julius Rudisch.
BOSTON, L. N. Albumin in urine, a new way of applying nitric acid, etc.....R 422
BOTCHFORD. See Chatard.
BOYDEN, CHARLES I. On the quantitative separation of maltose and lactose..... 993
BRADLEY, W. P., and A. W. Browne. A sensitive thermostat.....R 445
BRANNER, JOHN C. Geology of the N. E. Coast of Brazil, R 205; zinc and lead deposits of North Arkansas, R 82; Zinc and lead regions of North Arkansas.....R 126
BRANNER, J. C., and J. F. Newsom. The phosphate rocks of Arkansas.....R 524
Brass, aluminum in, R 20; Oil melting furnace .....R 301
BREED, MARY B. The polybasic acids of mesitylene.....R 354
BREED, R. S. Trachyte of Sunset, Col..... .....R 71
BREWER, WM. B. Mining in British Columbia, R 15; Boundary mining district B.C., R 416; Texada Island, B.C., R 80; The Crow's Nest Pass coal fields.....R 388
BREWER, WM. T. The Ketchikan mining district, Alaska .....R 80
BRIGGS, L. J., and M. H. Lapham. Capillary studies and filtration of clay, etc.....R 509
BRIGGS, LYMAN J. See Frank K. Cameron.
BRINSMADE, R. B. Concentration practice, R 219; Lead smelting in S. E. Missouri, R 301; Mining practice in Southeast Missouri .....R 81
Briquette plant in New Mexico.....R 346
Briquetting industry.....R 346
Bromoform, by electrolysis.....R 225
BROOKS, ALFRED HULSE: Copper deposits in Alaska, R 145; stream tin in Alaska, R 128
BROWN, ARCHER. The world's production of pig iron..... .....R 213
BROWN, E. D. See Torald Sollmann.
BROWN, H. C. Some Southern exhibits at the Pan-American..... .....R 80
BROWN, A. W. See W. P. Bradley.
BROWNING, PHILIP E. Estimation of alkali metals .....R 11
BRYAN, W. H. Smoke abatement in St. Louis.. .....R 296
BRYCE, P. H. The sewage disposal of suburban houses.....R 502
BUCHANAN, R. The false witness of the test bar..... .....R 414
BUCKHOUT, N. E. The Smith Mine, Tenn.. .....R 297
BUCKLEY, E. R. The clays and clay industries of Wisconsin.....R 5
BUERGER, LEO, and William J. Gies. Chemical constituents of tendenous tissue...R 91
Burette arrangement..... 476
BURR, H. M. See H. C. Sherman.
BURTON-OPITZ, RUSSELL. A comparative study of the viscosity of the blood .....R 363
BUSHONG, F. W. Analysis of magnesia water, Madison, Kan.....R 72
Butter: Detection of process, Pr 32; Influence of mold on composition, 711; Starch and glucose in..... .....Pr 35
Butyl alcohol, secondary, some new derivatives of.....R 87
Butyric acid in stomach..... ... .R 29
BUXTON, B. H. Bacterial purification of sewage ....R 365
BYERS, H. G., and Paul Hopkins. Investigation of the oil of the red elderberry, 771; An investigation of wood tar from Douglas fir..... 765

CABOT, J. W. The Bertrand-Thiel process .....R 348
Cadmium ferrocyanides..... 226
Caesium, double sulphates with thallium, R 341; Estimation as acid sulphate .....R 11
Calaverite..... .....R 123
Calcite, occurrence of greenockite on... .....R 449
Calcium, atomic weight, 203, 374; Carbide, metallic nodules in, R 221; Carbide, reduces alumina, R 159; Carbonate, solubility in salt solutions, R 272; Effect on rhythmic contraction.....R 467
Caliche of Southern Arizona, the.....R 5

Digitized by Google

CALKINS, FRANK C. A contribution to the petrography of the John Day Basin.....R 523
Calorimeter, the peroxide, 167; The Pfaundler .....R 443
Camass, poison, experiments with .....R 230
CAMPBELL, R. D. A rotary cement kiln, 248; Some preliminary experiments upon the clinkering of Portland cement..... 969
CAMPBELL, W. A., and H. W. Hoagland. Blood count at high altitudes .. ..R 29
CAMPBELL, W. The structure of metals and binary metals .....R 486
CAMPBELL, WILLIAM, and John A. Mathews. The alloys of aluminum..... 253
CAMERON, FRANK K. Soil as an economic and social factor, R 328; The solubility of gypsum in sodium chloride solutions, R 271; See Thomas H. Kearney.
CAMERON, FRANK K., and Atherton Seidell. Solubility of gypsum in salt solutions, R 271; Solubility of calcium carbonate in salt solutions.....R 272
CAMERON, FRANK K., and Lyman J. Briggs. Carbonates and bicarbonates in aqueous solution .....R 272
Camphene, constitution of 649
Camptonite, analcite-bearing.....R 454
Carbon: Dioxide in aqua ammonia, 380; Disulphide in the electric furnace, R 94; In steel, use of potassium ferric chloride for, 1076; Rapid determination by combustion, 1206; Tetrachloride, condensation with benzene derivatives, R 170; Trivalent 597
Carbonates and bicarbonates in aqueous solutions.....R 272
Carnotite, preparation of salts from.....R 19
CARPENTER, G. A. Sewage purification at Pawtucket.....R 236
CARTER, T. L. A note on cupels, R 417; See William Frear.
Casein, sulphur in..... 158
CASPARI, CHARLES E. Lauric acid and some of its derivatives, R 531; The fatty oil contained in the seeds of Lindera benzoin .....R 531
Casting, centrifugal.....R 349
Catalytic action, lecture experiments..... 498
Cathode plate, McCoy's.....R 162
Cell nucleus, rôle in oxidation.....R 232, 467
Cellulose, digestion experiments.....R 231
Cement, a rotary kiln, 248; Classification of crystalline, R 281; For streets, R 189; From blast-furnace slag, R 509; Slag, in Alabama, R 241; See also Portland cement.
Cephalin, from nerve substance.....R 535
Cerebrin, from nerve substance .....R 535
Cerium, precipitants..... 547
Chabazite, silver .....R 449
CHACE, E. M. See W. D. Bigelow.
Chains, manufacture .....R 489
Chalk of Southwestern Arkansas .....R 454
CHAMPION, E. C. Manufacture and chemistry of Portland cement.....Pr 43
Changes of address.....Pr 8, 30, 40, 45, 48, 52, 64, 74, 78, 82, 88, 97
CHATARD, Botchford and Holcombe. Cost of operating iron smelting plant.....R 298
Cheese, chemical changes in ripening .....R 375
Chelerythrine.....R 30
Chelidonic acid 17
Chelidonine, 2, 4 (fig.), 5, 18, salts..... 8
Chelidoxanthin.....17, R 235
Chemicals, minor, production of in U. S.....R 509
Chemist, North Dakota, report.....R 376
Chemistry, analytical and the phase rule, R 440; Canadian report, R 384; Of plant substances, R 534; Requirements of a technical course, R 508; The development of 117
CHESNUT, V. K. Problems in the chemistry and toxicology of plant substances....R 534
Chicago section .....Pr 58, 90
CHIKASHIGÉ, M. See M. Kuhara.
Chimney for acid vapors.....R 98
CHISHOLM, F. Cobaltiferous quartz, in Jalisco.....R 14

Digitized by Google

CHITTENDEN, RUSSEL H. Physiology of the pancreas....R 498
Chloral, condensation with the nitranilines.... 1063
Chlorine, determination in waters, R 208; Dry electrolytic process, R 527; In natural waters....R 453
CHRISTIE, JAMES. Modern developments in the production of open-hearth steel....R 525
Chromates, action on colloids....R 242
Chrome ore, electrical reduction of, R 82; In New Caledonia....R 220
Chromic acid, estimation, rapid method....R 207
Chromite as a hearth-lining....R 82
Chrompicotite in Canada....R 205
CHURCH, EDWIN S. Minting machinery and appliances....R 162
CHURCHILL, G. W. See W. H. Jordan.
Cincinnati section....Pr 79
Cinnamic acids, the three stereomeric....R 168
Citrate-insoluble phosphoric acid, determination of.... 25
Citric acid, manufacture....R 243
CLAPP, A. W. Iron making at Port Townsend, Wash....R 212
CLARK, H. W. Bacteria in ice, R 177; Pollution of streams by waste liquors....R 179
CLARK, WM. BULLOCK, and Geo. Curtis Martin. Eocene in Maryland....R 126
CLARK, WM. B., C. C. O'Harra, R. B. Rowe, and H. Ries. Mineral resources of Allegany County, Md....R 9
CLARKE, F. W. A thermochemical constant, 882; 9th annual report of Committee on Atomic Weights, 201; The calculation of atomic weights, R 437; The development of chemistry.... 117
CLARKE, F. W., and George Steiger. Action of ammonium chloride on silicates....R 118
CLARKE, MARY E. See J. H. Kastle.
CLAY, G. HARRY. See W. A. Noyes.
Clays, German artificial, R 188; of Maryland, R 410; of Minnesota, R 282; of Wisconsin....R 5
Cliftonite, internal structure....R 385
Clinkering of Portland cement.... 969
CLINTON, L. A. Buying and using commercial fertilizers....R 372
CLOTHIER, R. W. See J. T. Willard.
Coal, burning powdered, R 189; Camden field, Ark., R 145; Compared with oil, R 186; Coos Bay fields, R 296; Electrical income from, R 99; Fields of the United States, R 454; Geology of Eastern Choctaw field, R 145; And illuminating gas, relative heating power, R 71; In British Columbia, R 388; In Cape Breton, R 80; In Michigan, R 342; In Texas, R 452; Pacific resources, R 398; Production in the U. S., R 457; Sulphur in, determination, 852; Peroxide calorimeter applied to, 167; The British question, R 211; *Anthracite*, in Arkansas, R 346; Weathering of, R 95; *Bituminous*, washing of, R 295; Burning....R 98
Coal-tar, industry, progress in 15 years....R 187
Cobalt, new qualitative test, 578; Organic salts in solution, 1012; Production in 1901, R 415
Cobaltiferous quartz in Jalisco....R 14
COHN, ALFRED I. Blue-print and black-print photographic papers....R 396
Coke, production in 1901, R 487; By-product ovens....R 370
Coking industry....R 39
COLBY, A. L. Machine cast foundry pig iron....R 83
COLBY, G. E. Instantaneous bleaching liquid for nuts....R 541
COLEMAN, A. P. Nepheline and other syenites near Port Caldwell, Ont....R 450
COLLES, G. W. Opportunities for improvement in mica mining....R 295
COLLIER, A. J. Mining conditions in the Nome region, Alaska....R 416
Collinsonia Canadensis root, no alkaloid in....R 321
Colloidal salts.... 632
Colloidal solutions, osmotic properties....R 362
Colloids, action of chromates on....R 242
Columbus section....Pr 36
Combustion apparatus, Shimer's....R 164

Digitized by Google

Concrete, coefficient of expansion..... ..... R 189
Conductivity, of concentrated solutions, R 438; Of hydrogen ion..... 944
Conglutin, sulphur in..... 154
CONNER, LEWIS A. On the causes, etc., of the color of the feces .....R 500
CONNER, M. FRANK. See John A. Dresser.
CONSTON, F. Phosphatic slag in agriculture.....R 42
Contact irritability of muscles..... .....R 421
Contiguity of ore deposits of different generic relationships .... R 4
COOK, ALFRED N., and C. F. Eberly. Derivatives of phenyl ether, III 1200
COOKE, H. L. See H. T. Barnes.
Copper, alloys with aluminum, 264; Ancient smelting in Mexico, R 300; Electrolytic precipitation, 1073, R 349; Fusing-point and phase rule, R 440; Improved method of manufacturing, R 86; Improvements in dressing Lake Superior ore, R 391; in steel wire, R 18; Intercolonial plant in N. B., R 86; Note on certain minerals, R 4; Precipitation, R 19; Presence in powdered drugs, R 322; Sand castings, R 86; Reduction of, by ferrous salts, R 70; U. S. supply, R 487; Vs. aluminum, R 86; World's production, R 459; *Determination:* As cuprous sulphocyanide, R 289; by aluminum foil, 478; By potassium permanganate, 708; Iodide method, 1083; Lake Superior fire assay, 699; Volumetric, 580; *Mines and Mining:* Anaconda Co's. new works, R 350; Alaska, R 145, 146; Ashio, R 15; Cuba, R 157; Developments in the south, R 493; Japan, R 158; North California, R 460; Virgilia district, R 81; Lake Superior, R 300; Oklahoma.....R 123
Copper sulphate, action on iron meteorites, R 450; Mixed crystals with zinc sulphate..... .....R 2
Corn, improvement of .....R 374
CORNELISON, R. W. Note on the production of acylamines 1028
CORNWALL, H. B. Occurence of greenockite on calcite, in Missouri .....R 449
Corundum in Canada, R 6; In Connecticut, R 523; In Montana, R 160; In the U. S..R 127
Cotton-seed, Sea Island, chemical study of.....R 513
COTTRELL, H. M. Spontaneous combustion of alfalfa .....R 511
COUGHLIN, PAUL. The preparation of bromoform by electrolysis .....R 225
Council, minutes of..... .....Pr 1, 24, 37, 71, 95
COWLES, W. L. Ore-handling plant at Homestead .....R 83
CRAMPTON, CHARLES A. Influence of the growth of mold on oleomargarine and butter, 711; Sugar and the new colonies..... .....R 49
CRAWFORD, CH. H. See C. H. Fulton.
CRAWLEY, J. T. Fixation of phosphoric acid in soil..... 1114
Creosote, treatment of wood with ....R 426
Creosoted blocks..... .....R 40
CROCKARD, F. H. Modern iron blast-furnace practice.....R 212
CROFTON, ALFRED C. Function of ferments in the blood, R 422; Intermediary circulation of the bile acids, R 131, 499; Preliminary communication on the diastatic ferment of the suprarenals.....R 421
CROSBY, W. O. History of hematite iron ores of the Antwerp and Fowler belt, N.Y..R 282
CROSS, WHITMAN. The development of petrography in the 19th century..... ..R 454
CROSS, WHITMAN, and Arthur Coe Spencer. Geology of Rico Mts., Col .....R 143
Crude fiber, determination 1210
Crystallization under electrostatic stress.....R 269
CULLUM, MYRTIS L. See J. I. D. Hinds.
CUMMINGS, URIAH. American rock cement ....R 74
Cupelling, losses of silver in.....R 462
Cupels, note..... R 417
Cuprous sulphocyanide, precipitation of .....R 129
CURIE, P. See Henri Becquerel.
CUSHMAN, ALLERTON S. Complex compounds of thallium .. ..R 117
CUSHNY, ARTHUR R. On saline diuresis..... ....R 233
CUTTER, W. D., and William J. Gies. Composition of tendon mucoid.....R 29
Cyanide plant at Ely, Nevada .....R 154

Digitized by Google

Cyanide process, progress in 1901, R 218; Treating exhausted solutions.....R 218
Cyanogen bands, structural peculiarities of.....R 444

DAIRY products, R 46; Analysis of.....R 539
DALE, T. NELSON. Structural details in the Green Mountain Region, etc.....R 523
DALES, BENTON. See L. M. Dennis.
DANZIGER, J. L. A new qualitative test for cobalt, 578; See E. H. Miller; See H. C. Sherman.
DARTON, NELSON HORATIO. Geology of the Black Hills, etc.....R 149
DAVIS, CHARLES B. New form of alkalimeter.....391
DAVIS, CHAS. A. A second contribution to the natural history of marl.....R 7
DAVIS, J. The sewerage systems of Sydney, N. S. W.....R 239
DAVISON, JOHN M. Internal structure of cliftonite.....R 385
DAY, DAVID T. Mineral resources of the U. S., 1900, R 128; Department of Mines at St. Louis World's Fair.....R 209
DAVY, J. B. See R. H. Loughridge.
Deceased members.....Pr 9, 49, 53, 79, 83, 100
DEHN, WILLIAM M. See Arthur W. Palmer.
DELAY, T. S. Prospecting in Mexico.....R 78
DENBY, CHARLES. Agriculture in China.....R 49
DENHAM, HENRY H. An automatic gas-generator.....1080
Denitrification, studies in.....785
DENNIS, W. B. A borax mine in Southern Oregon.....R 395
DENNIS, L. M., and Benton Dales.....401
DENNISON, CHARLES H. See Augustus H. Gill.
DENTON, J. E. Beaumont oil as fuel.....R 185
DERBY, ORVILLE A. Occurrence of monazite in iron ore and graphite, R 205; The manganese ore deposits of the Queluz.....R 122
Developers, substitute for alkalies in.....R 242
Development of chemistry, the.....117
DEWAR, JAMES. Liquid hydrogen.....R 68
Dextrins, hydrolysis of.....R 386
Dextrose-fermentation, does the pancreas contain an enzyme?.....R 316
Diabase, var. holyokeite.....R 455
Diabetic foods.....R 28
Diacetyl peroxide.....R 310, 234
Diamond deposits of Salobro, Brazil.....R 77
Diastatic ferment of the suprarenals.....R 421
Dichloracetylphosphide.....R 304
DICKIE, ALBERT E. On the manganese ferrocyanides.....1023
DIEDERICH, HENRY W. Beet-sugar production for 1901.....R 187
Dielectric constants.....R 275, 276
Digestion, pancreatic.....R 463
Digestion of gelatine, effect on properties.....R 464
DILLER, H. E. Effect of melting steel with iron in the cupola.....R 459
DILLER, J. S., and George Steiger. Volcanic dust and sand from St. Vincent, etc..R 409
DILLER, J. S. The copper region of North California.....R 460
Dimethylbenzyldimethybenzal hydrazone.....1066
Dinitromethyl phenylether.....1203
Diphenylnitrosamine.....1194
Diphylline 4 (fig.).....14
Directors, Board of, minutes.....Pr 31, 94
Diseases, infectious.....R 361
Disinfection of passenger cars.....R 500
Dissociation: Of certain acids, bases and salts, R 263; Of monatomic alcohols, ethers and salts.....R 164
Dissociation theory and instantaneous reactions.....R 273
Diuresis.....R 232, 233
DIXON, C. W. The condition of nickel in pyrrhotite from Sudbury.....R 415

Digitized by Google

Dodge, F. D. The constitution of camphene..... 649
Dorsey, C. W. The soils of Allegany County, Md..... R 9
Double halogen salts, generalizations on ..... R 1
Douglas, James M. See Harry C. Jones.
Douglass, R. A. On the use of zinc in boilers.....R 190
Dresser, John A. A petrographical contribution to the geology of East Quebec, R 450; On the petrography of Shefford Mountain..... R 9
Dudley, C. B., and M. E. McDonald. The disinfection of passenger cars... .....R 500
Dudley William L. The action of fused sodium dioxide on metals.....R 521
Duggar, J. F. The cowpea and velvet bean as fertilizers.....R 399
Duty-free importations, report of committee on.....Pr 1
Dunlap, Frederick L. The production of acylamines, etc 758
Dyeing, instruction in.....Pr 10
Dyer, Bernard. Results of investigations on the Rothamsted soils .....R 328

[redacted]akle, Arthur S. Mineralogical notes .....R 124
Earth worm, movements of .....R 233
Ebaugh, W. Clarence. The atomic weight of arsenic 489
Eberle, F. Zinc and lead mining in S. W. Missouri .....R 219
Eberly, Charles F. See Alfred N. Cook.
Eccles, David C. The action of isovaleric aldehyde on antipyrine, 1050. See Marston Taylor Bogert.
Eckel, Edwin P. Slag cement manufacture in Alabama, R 241; The classification of the crystalline cements.....R 281
Eddy, Harrison P. Sewage work at Worcester, Mass., R 32; The effect of pickling liquids on sewage treatmant, R 469. See Leonard P. Kinnicutt.
Edestan 29, 32, 62
Edestin, a hydrolytic derivative of, etc., 28; Reactions of, with acids and alkalies, 39; Sulphur in 143
Edison nickel iron cell, theory of.....R 277, 279
Elastic tissue, chemical studies of .....R 318
Eldridge, George H. Asphalt deposits of the U. S.....R 150
Electrical incomes and outputs.....R 99
Electrical waves, and chemical action .....R 270
Electric furnace, R 162; In industrial chemistry, R 353; Manufacture of barium compounds in, R 369; With magnetic field.....R 85
Electricity: And plant life, R 191; Application in iron and steel mills, R 413; locating metals by .....R 81
Electro-affinity, R 266; As a basis for a system.....R 446
Electrochemical industry, R 161, 221, 353; in France, R 85; Progress in.....R 20
Electrochemical Society, the American 581
Electrochemistry, recent developments .....R 419
Electrolytic alkali works, analyses for..... 469
Electrolytic apparatus.....R 201
Electrolytic processes, R 526, 527; Soda and bleaching-powder.....R 371, 395
Electrolytic rectifier, theory of.....R 277
Embryo-chemical investigations .....R 361
Emerson, B. K. Holyokeite, a purely feldspathic diabase, etc., R 455; On corundum, etc., from Barkhamsted, Conn.....R 523
Emerson, Harrington. The coal resources of the Pacific .....R 398
Emery, A. L. Rapid volumetric method for determining phosphoric acid in fertilizers..... 895
Emery, W. O. Derivatives of pyrimidine.....R 224
Enameling.....R 190
Enzymes and spermatozoa, R 28; Influence of heat on, R 420; Of green sorghum, R 511; Reversibility of, R 230; Vegetable proteolytic .....R 465
Epinephrin, behavior to Fehling's solution, R 92; Preparation of.....R 234
Erb, E. S. See F. J. Pond.
Eschka's method and pig irons..... 644

Digitized by Google

Esmeralda formation.....R 144
Essonite, graphitic, in Connecticut.....R 523
Esters, action of liquid ammonia on.....R 303
Ethyl alcohol, action on bromides of propenyl compounds.....327
Ethylene, heat of dissociation and combustion.....R 268
Ethylene cyanide, hydration of.....20
Evans, A. W. Bauxite mining in Georgia.....R 463
Evans, P. N., and C. E. Vanderkleed. Dichloracetyl phosphide.....R 304
Excelsin, sulphur in.....146
Exner, Franz F. See Edgar F. Smith.
Explosive, a new.....R 241

Farming, arid or dry.....R 375
Farrington, E. H. Method of calibrating Babcock test bottles.....R 247
Farrington, Oliver C. A new meteorite from Kansas, R 451; Meteorite studies I., R 482; The action of copper sulphate on iron meteorites, R 450; The constituents of meteorites, R 8; The pre-terrestrial history of meteorites.....R 73
Fat proteid compounds.....R 465
Fatty series, substitution in.....R 304
Fawcett, Waldon. A new Canadian iron and steel plant, R 388; Cast iron for car wheels, R 216; Ore handling at furnaces.....R 347
Fay, A. E. Centrifugal casting.....R 349
Fay, Henry, and C. B. Gillson. The alloys of lead and tellurium.....R 199
Fay, Henry, and Harrison Everett Ashley. The alloys of antimony and tellurium.R 200
Feces, color of.....R 500
Feeding-stuffs, analyses.....R 248, 331, 402
Feldspar corundum rock, California.....R 124
Ferric hydroxide, colloid, absorption spectrum.....R 269
Ferments, certain oxidizing, R 131; Function of, in blood, R 422; Inorganic, R 274; Inorganic, effect of certain poisons on, R 421; Phenolphthalein as reagent for..R 131
Ferrocyanides: Of cadmium, 226; Of manganese, 1023; Of zinc.....823
Ferromolybdenum, a volumetric method for.....188
Ferro-silicon, determination of silicon in.....R 484
Ferrous salts, reduction of copper by.....R 70
Ferrous solutions, oxidation by free oxygen.....R 270
Fertilization, nature of process.....R 130
Fertilizers, R 135, 248; Analyses, R 48, 331, 402; Available nitrogen, 870 ff; Chemical, tomato culture with, R 193; Commercial, for onions, R 247; Commercial, use of, R 372; Cowpea and velvet bean as, R 399; Determination of phosphoric acid, 895; Field experiments, R 329; For forcing lettuce, R 329; For greenhouse, R 373; Grass experiments, R 400; Nitrate of soda on market garden crops, R 510; Nitrogenous, pot experiments, R 330; Oil-cake for, R 191; Organic nitrogen availability, R 401; Plant food trials, R 329; Tests on tomatoes, R 511; Utility of alkaline phosphatic.....R 375
Fertilizing, effect on humus, R 135; Value of meadow muck.....R 102
Field, H. E. The grading of pig iron, R 215; The metallurgy of the cupola.....R 490
Fifth International Congress of Applied Chemistry.....Pr 91
Fire-clays, origin in coal measures.....R 121
Fireproof floors, tests.....R 426
Fire-proofing of wood, recent advances.....R 506
Fischer, Martin H. Further experiments on artificial parthenogenesis in annelids.....R 422
Fischer, R. Alkaloids of two plants, R 31; Sanguinaria alkaloids.....R 30
Fitzgerald, Francis A. J. Artificial graphite.....R 240
Flames, spectra of during basic Bessemer blow.....R 3
Flasks, device for marking.....246
Flexner, Simon, and Hideyo Noguchi. Snake venom in relation to hemolysis, etc. R 317
Flooring material, aseptic.....R 366
Flue dust, briquetting.....R 525

Digitized by Google

FLYNN, BENJ. H. The septic treatment of sewage.....R 366
FOLIN, OTTO. Determination of total sulphates in urine.....R 318
FOLIN, OTTO, and Philip A. Shaeffer. Phosphate metabolism..... R 318
Food: Adulteration, R 46, 539; Analysis of, R 373, 515, 539; Human, investigations of, R 514; Inspection of, R 515; Preservatives, use and abuse, Pr 42; Products, sixth report on, R 331; Standards.....R 540
Foods: And food adulterants, R 376; And feeding-stuffs, R 45; Cereal breakfast....R 515
FOOTE, H. W. Mixed crystals of copper and zinc sulphates, R 2; Mixed crystals of silver chlorate and sodium chlorate, etc.....R 447
FORBES, ARTHUR A. The new sewage disposal works at Pittsfield, Mass. .....R 367
FORD. See S. L. Penfield.
FORD, A. G. See F. J. Pond.
Formaldehyde, combination with Witte's peptone, R 363; Physiological action .....R 131
Formula $dT = 0.02T^2/L$, new proof.....R 270
Fossils, photography of.....R 343
Foundry costs, recording, R 489; Economy .....R 349
FOWLER, GILBERT J. Management of septic tanks.....R 33
FRANK, F. J. Mexican meeting, Mining Engineers.....R 209
FRAPS, G. S. Determination of sulphur in plants, 346; The solubility of barium sulphate in various chlorides, R 484. See also W. A. Withers.
FRAZER, J. C. W. See H. N. Morse.
FREAR, W., and C. P. Beistle. Analyses of rose oils.....R 135
FREAR, WILLIAM, and M. H. Pingree. Creaming of milk during its sale 1136
FREAR, WILLIAM, and W. F. Carter. Pennsylvania sugar-beets in 1901 ..... R 400
FREER, PAUL C., and Frederick G. Novy. Benzoylacetyl and diacetyl peroxides, R 234, 310
Freezing-point lowering in aqueous solutions.....R 438, 439
Friedel-Crafts reaction, for carbon tetrachloride.....R 170
FRIEDMAN, L. W. Alabama's iron and related industries .....R 215
FUHS, FLORA C. A new test for albumin .....R 208
Fuels: Briquettiug, R 346; Development of industrial, R 211; Liquid, combustion of, R 508; Result of imperfect combustion.....R 501
FUKUI, M. See M. Kuhara.
Fulgurite from Poland .....R 343
FULLER, HENRY F. Sand filters for water .....R 175
Fuller's earth .....R 74
FULMER, ELTON. Notes on Halphen's test for cotton-seed oil 1148
FULTON, C. H., and Ch. H. Crawford. Assay of zinc precipitates.....R 157
Fumaric acid, as precipitant for thorium..... 901
Fungicides, analysis of .....R 248, 540
Furnace: An adobe reverberatory, R 460; An electric resistance, R 85; Electrical pigment, R 99; New roasting, R 490; The Chase roasting, R 460. See also Electric furnace.

GALE, HENRY C. Relation between density and index of refraction of air.....R 269
Galvanic cells, internal resistance.....R 276
GANE, E. H. Presence of copper in powdered drugs and chemicals.....R 322
Garbage, disposal, Milwaukee .....R 184
Garbage, reduction, Buffalo .....R 184
Gas: Apparatus, Hempel's modifications, R 294: Engines, fuel mixtures, R 99; Fields, Texas and Gulf Coast, R 151; For power in Mexican mines, R 160; Generator, automatic, 1080; Natural, in New York, R 281; Producers, improved blowers ...R 347
Gastric acidity .....R 499
Gauge, for small pressures.....R 445
GAVETT, ANDREW J. Septic tank at Plainfield, N. J.....R 181
GEER, WILLIAM C. Thermostats and thermoregulators.....R 444
GEISSEL, H. L. Mining industries in Spain, R 14; The mining industries of Mexico .....R 79
Gelatine, digestion of .....R 464
Generalizations on double halogen salts.....R 1

Digitized by Google

Geological Survey, report of North Dakota.....R 77
Geology, Black and Grand Prairies, Texas, R 411; Black Hills, R 149; Chandler and Koyukuk Rivers, Alaska, R 146; E. Valencia Co., N. M., R 151; Eastern Quebec, R 450; Eocene in Maryland, R 126; Fox Islands, Maine, R 384; Green Mountain Region and Eastern New York, R 523; Northeast coast of Brazil, R 205; Newark system in Connecticut, R 146; Nez Perce Co., Idaho, R 125; Nineteenth Annual Report New York State, R 280; Nome and Norton Bay Regions, R 416; North America, bibliography for 1901, R 524; Of New Jersey, R 127; Of Rigaud Mountain, R 124; Of West Virginia, R 81; Philippine Islands, R 149; Report of Canadian Survey, 1901, R 384; Rico Mountains, Col., R 143; Saddle reefs of Bendigo, R 281; Salines of N. Lousiana, R 455; Silverton Quadrangle, Colorado, R 383; The Berkeley Hills, R 288; The High Plains, R 149; The Keweenawan and Keewatin areas.....R 124
GETMAN, FREDERICK H. See Harry C. Jones.
GIBSON, G. H. Electricity in mining.....R 351
GIBSON, HARRIET WINFIELD. See Herman T. Vulté.
GIES, WILLIAM J. A new constituent of bone, R 131; Do spermatozoa contain enzymes? R 28; Nature of process of fertilization, R 130; See Leo Buerger; See W. D. Cutter; See P. B. Hawk; See L. D. Mead; See H. R. Posner; See A. N. Richards; See I. O. Woodruff.
GIESEL, H. L. Mining industries of Germany.....R 152
GILL, AUGUSTUS H. Test for gumming quality of lubricating oils..... 467
GILL, AUGUSTUS H., and Charles H. Dennison. The Bechi test for cottonseed oil.... 397
GILL, A. H., and H. R. Healey. Some thermal properties of naphthas and kerosenes, R 533; and Allan W. Rowe, the analytical constants of certain oils..... 466
GILLSON, C. B. See Henry Fay.
GOETTSCH, HENRY M. See Launcelot W. Andrews.
Gold, action of selenic acid on, 354; Carolina deposits, R 13; Deposits, Blue Mountains, Oregon, R 150; Dredging fields of Eastern Russia, R 156; Dredging in Idaho, R 302; Dredging in North Carolina, R 80; Electrolytic precipitation, R 417; Fusing-point and phase rule, R 440; Future of Witwatersrand field, R 156; Glacial in Wisconsin, R 496; Halides, R 1; In Kansas shales, R 495; In Kansas shales, R 522; In North Carolina, R 287; Mining in E. Ontario, R 217; Modern extraction methods, R 217; Natural telluride, 355; Ore, mining, expense in Colorado, R 417; Ores, assay of, R 16; Production, 1901, R 216; Regions, Mindanao Island, R 80; Russian mining law, R 156; Salts, action of tellurium and selenium on, 918; sands of Cape Nome.....R 495
GOLDSTEIN, ALBERT H. See Charles F. Mabery.
GOMBERG, M. On trivalent carbon (4th paper) 597; On triphenylmethyl .....R 88
GOOCH, F. A., and O. S. Pulman, Jr. Estimation of molybdic acid reduced by hydriodic acid.....R 130
GOOD, C. A. The excretion of lithium.....R 231
GORDIN, H. M. Note on the estimation of berberine.....R 322
GORDIN, H. M. Does the root of Collinsonia Canadensis contain an alkaloid?.....R 321
GORDIN, H. M. Occurrence of berberine in plants.....R 321
GORDIN, H. M., and C. G. Merrill. The so-called pure berberine of Gaze.....R 93
GORDON, C. H. Origin and classification of gneisses.....R 287
GORDON, FREDERICK T. The influence of synthetic remedies on urine tests, etc....R 464
GOTTSCHALK, V. H. See E. T. Allen.
Glass of low solubility..... 893
Glaucine..... 31
GLENN, WM. Chromite as a hearth-lining.....R 82
Gliadin, sulphur in..... 151
Glucinum, new salt.....R 201
Glucose in butter, Pr 35; In cane-sugar syrup, fallacious test for.....R 322
Glucophosphoric acid, preliminary communication on..... 190
Glutarimide, production from nitrile..... 20
Gluten and diabetic foods.....R 28

Digitized by Google

Glycinin, sulphur in 149
Glycosuria caused by adrenalin .....R 171
Gneisses, origin and classification.....R 287
GRAMMER, F. L. The electrical burner for blast-furnaces.....R 83
Granite, Stone Mountain of Georgia .....R 342
Graphite: Artificial, R 240; monazite in.....R 205
GREEN, ARTHUR C. Progress of the coal-tar industry in England and Germany...R 187
GREEN, ERIK H. See James F. Norris.
GREEN, ERIK H., and R. W. Tower. Ichthylepidin in scales of American fishes...R 361
Greenockite, on calcite in Missouri.....R 449
GREER, F. W. The Beaumont oil field .....R 243
GREGG, H. B. Oil fuel for locomotives .....R 186
GRIFFIN, MARTIN L. Analysis of spent alkaline-liquor 235
GRIMSHAW, R. The world's progress in science, etc., in 1901.....R 209
GRIMSLEY, G. P. Kansas mines and minerals.....R 72
GRISWOLD, L. S. The intercolonial copper plant in N. B.....R 86
GROOS, J. An adobe reverberatory furnace.....R 460
GUENTHER, R. German artificial clay.....R 188
GUESS, H. A. Notes on the estimation of copper by potassium permanganate..... 708
GUILLAUME, C. E. Industrial applications of nickel steel.....R 17
Gutta percha in the Philippines.....R 241
GUYOT, YVES. The sugar question in Europe.....R 187
Gypsum, solubility, 667; Solubility in salt solutions .....R 271

HAIR, voluntary erection of .....R 466
HALE, F. E. Initiative action of iodine, etc., in the hydrolysis of starch, R 386; On standard tartar emetic and its structural formula 828
HALL, CLARENCE A. See George Edward Thomas.
HALL, C. W. Keweenawan and Keewatin areas.....R 124
HALL, R. D. Lead thiocyanate..... 570
HALL, R. D., and Victor Lenher. Action of tellurium and selenium on gold salts, etc 918
Halphen's test..... 1148
HALSEY, J. T. Studies in diuresis.....R 232
Hammer scale, removal of.....R 459
HAMMOND, J. HAYS. The future of the Witwatersrand gold field.....R 156
HAND, W. F. See Marston T. Bogert.
HARCOURT, R. Report of the professor of chemistry.....R 331
HARDING, EVERHART P. Trimethylbenzaldazine and trimethylbenzyltrimethylbenzal hydrazone..... 1068
HARDING, EVERHART P., and E. W. Rice. Preparation of dimethylbenzyldimethylbenzal hydrazone 1066
Hargreaves-Bird process.....R 395
HARRINGTON, H. H., and P. S. Tilson. Willis and Huntsville tobacco soils.....R 328
HARRIS, C. D. Determination of citrate-insoluble phosphoric acid 25
HARRIS, G. D. Geology of Louisiana .....R 455
HARRIS, ISAAC F. See Thomas B. Osborne.
HARRIS, S. H. The mathematical expression of the periodic law.....R 270
HARROLD, C. C. See F. C. Lee.
HARTLEY, W. N. An investigation of the spectra of flames, etc. .....R 3
HARTMAN, CH. M. A. The first plait in van der Waal's free-energy surface .....R 270
HARTMAN, F. The mills of the San Juan .....R 217
HARTMAN, J. Notes on tuyeres.....R 348
HARTWELL, B. L. Pot experiment concerning soil deficiencies.....R 134
HASCHEK, EDUARD. Spectroscopic studies.....R 444
HASSELBRING, H. See S. A. Beach.
HAWK, P. B., and William J. Gies. Composition of the albumoid in bone, R 232; Composition of osseoalbumoid, etc., R 466; On the quantitative determination of acid albumin, etc.. .....R 497
HAWORTH, ERASMUS, and John Bennett. Native copper near Enid, Ok.....R 123

Digitized by Google

HAYES, CHARLES WILLARD. The Arkansas bauxite deposits, R 148; Tennessee white phosphate.....R 149
HAYES, J. ARTHUR. Some compounds of pyridine 360
HAYWOOD, J. K. Analysis of insecticides and fungicides .....R 248
HAZLEHURST, S. F. The Cripple Creek mining district .....R 79
HEADDEN, WM. P. A soil study, part III.....R 103
HEALEY, H. R. See A. H. Gill.
Heart muscle, influence of various salts on .....R 92
Heat: Of combustion in fatty oils, 348; Of formation.. 882
HEATH, GEORGE L. The Lake Superior fire assay for copper..... 699
HEBER, VON GEORG. Electricity and plant life.....R 191
HEILEMAN, W. H. Alkali and alkali soils.....R 101
HEIMROD, GEORGE W. See Theodore W. Richards.
HEINZE, JOHN O., Jr. Varying degrees of activism of the X-rays.....R 441
HERTER, C. A. On adrenalin glycosuria, etc.....R 362
HERTER, C. A., and A. N. Richards. Glycosuria caused by adrenalin ....R 171
HERZOG, MAXIMILIAN. Does the pancreas contain a dextrose-fermentation enzyme? R 316
HESS, E. H. Effect of fertilizing on humus of the soil.....R 135
HEYL, PAUL R. Crystallization under electrostatic stress.....R 269
HILGARD, E. W. See F. J. Snow.
HILL, G. E. Sewage disposal plant at Collingwood, N. J.....R 368
HILL, HENRY B., and Geo. R. White. On nitropyromucic acid.....R 313
HILL, HIBBERT W. An investigation of the Boston ice supply .....R 238
HILL, J. C. See S. S. Maxwell.
HILL, ROBERT T. Geography and geology of the Black and Grand Prairies, R 411; The upland placers of La Cienega, Mexico.....R 217
HILL, ROBERT T., and I. C. Russell. Volcanic rocks of Martinique, etc.....R 447
HILLEBRAND, W. F. Common errors in determination of silica, 362; Composition of yttrialite, R 152; Discussion of analyses of volcanic ejecta from Martinique, etc., R 448; Some principles and methods of rock analysis.....R 481
HILLEBRAND, W. F., and S. L. Penfield. Some additions to the alunite-jarosite group.....R 456
HILLYER, H. W. Phenoxozone derivatives, R 24; See also Gideon Benson.
HINDS, J. I. D., and Myrtis L. Cullum. Photometric determination of iron.. 848
HINES, C. H. The application of electricity in steel and iron mills .....R 413
Histon group, relation of edestin to, 28; Bang's definition of,..... 36
HOAGLAND, H. W. See W. A. Campbell.
HOBBS, WM. HERBERT. The Newark system in Connecticut, R 146; The old tungsten mine at Trumbull, Conn.....R 282
HOFFMAN, G. CHR. Analyses of Canadian minerals, R 9; On the occurrence of chrompicotite in Canada, R 205; Report of the section of chemistry and mineralogy.....R 384
HOGARTY, HARRY. Andesite of Boulder Co., Col .....R 71
HOLCOMBE. See Chatard.
HOLLEY, CLIFFORD D. Liquid mixtures of minimum boiling-point 448
HOLMES, J. G. See T. H. Means.
Holyokeite .....R 455
Homochelidonine.....R 30, 31
HOOKER, DONALD R. See L. B. Mendel.
HOPKINS, CYRIL G. Fixation of atmospheric nitrogen by alfalfa, etc..... 1155
HOPKINS, PAUL. See H. G. Byers.
HOPKINS, T. C. Origin of the coal measure fire-clays.....R 121
Hordein, sulphur in 151
HORMELL, WILL G. Dielectric constant of paraffins.....R 275
HOSCH, GEORGE E. Gravimetric estimation of hydrogen peroxide, (suppl. note) 479
HOUGH, THEODORE. Ergographic studies in muscular soreness.....R 319
HOWARTH, O. H. Old time mining in Mexico.....R 81
HOWE, ERNEST. Intrusion and erosion .....R 146

Digitized by Google

HOWE, H. M. An electric resistance magnesia crucible furnace, R 85; Metallurgical laboratories ..... R 457
HOWE, JAMES L. The oxygen bases ..... R 529
HOWELL, W. H. Influence of various salts on contraction of heart muscle ..... R 92
HUGER, WM. E. Cyclic albuminuria ..... R 420
HUGHES, JOHN. The utility of alkaline phosphatic manures ..... R 375
HULETT, GEORGE A., and Lucius E. Allen. The solubility of gypsum 66
HULST, N. P. Moisture in Lake Superior iron ores ..... R 527
Humus, renewal in corn culture ..... R 192
HUNNEWELL, MISS M. P. See C. E. A. Wilson.
HUNT, REID. Experiments with Zygadenus venenosus, R 230; The toxicity of methyl alcohol ..... R 500
HUNTER, S. J. Artificial parthenogenesis by use of sea water ..... R 30
HUNTLEY, F. A. The surface of soils ..... R 193
Hussakite ..... R 450
HUSTON, H. A. Fertilizer tests on tomatoes, R 511; The sugar beet in Indiana ..... R 193
HYDE, EDWARD P. See Harry C. Jones.
Hydraulic limestone of Southeastern Indiana ..... R 8
Hydrocarbons, solubility of metallic soaps in 215
Hydrochloric acid, formation of, in animal organism, 138; Separation from hydrocyanic ..... R 387
Hydrocyanic acid, separation from hydrochloric ..... R 387
Hydrogen, from silicides, R 221; ion, equivalent conductivity, 944; liquid, R 68; spectra of ..... R 3, 268
Hydrogen peroxide, decomposition at high temperatures, R 117; Gravimetric estimation, 479; Lowering of freezing-point ..... R 265
Hydrogen sulphide, action on arsenic acid, R 201; Dissociating power of, R 263; Generator, 476; interaction with arsenic acid 661
Hydroxyazobenzenes 1184

ICE, bacteria in, R 177; Boston supply ..... R 238
Ichthylepidin, in American fishes ..... R 361
Igneous rocks of Great Basin, variation of texture ..... R 72
Illuminating gas and coal, relative heating power ..... R 71
Incandescent mantle, theory of ..... R 505
Indigo, methyl derivatives ..... R 225
Indigo red, influence in indigo dyeing ..... R 315
Inert constituents of the atmosphere ..... R 3
INGALL, E. D. Canadian mineral statistics ..... R 9
INGALLS, W. R. progress in zinc smelting in 1901, R 219; The production of zinc ore in the U. S., R 392; treatment of mixed sulphide ores containing zinc, etc ..... R 417
Inhibition of chemical reactions 297
Insecticides, R 47; Analysis ..... R 248, 540
Intrusion and erosion ..... R 146
Iodide of starch 865
Iodide method for copper 1082
Iodine, in hydrolysis of starch ..... R 386
Ions, antitoxic effect of, R 468; Apparatus for determining relative velocity, R 264; physiological effect of valency and electric charges ..... R 173
Iron, American trade in 1900, R 214; British Trade Commission, R 488; Coagulant, process, R 425; Colorado company, R 525; Determination of manganese in, 243; Effect of fusing steel with, R 459; False witness of test bar, R 414; Geology of Mesabi region, 297; In Cape Breton, R 80; In New South Wales, R 154; Industry, Alabama, R 215; Iowa's mine, R 297; Manufacture at Port Townsend, Wash., R 212; Manufacture, on Lake Superior, R 215; Mining in New Jersey, R 213; Minnequa works, Colorado, R 298; Photometric determination, 848; Puddled, mechanical means for, R 413; Removal of, from zinc blende, R 82; Resources of Texas, R 388; Separation of zinc from, 1211; Situation of the trade in Europe, R 214; Smelting plant, cost of operation, R 298; Sunrise Mines, Wyoming, R 299;

Digitized by Google

Supposed meteoric, R 120; The Pittsburg trade in 1901, R 215; The Smith Mine, Tenn., R 297; *Cast:* R 459; Accuracy in testing, R 489; Constitution, R 458; For car wheels, R 216; Heat treatment, R 216; Standard specifications, R 458; *Pig:* Crystalline sulphide in, R 84; Determination of sulphur in, 644; Electrical manufacture, R 213; Grading of, R 215; Machine cast, R 83; Production in 1901, R 298; Production in 1902, R 487; Production in U. S., R 458; The world's production, R 213; Valuation for foundry purposes ..... R 488
Iron and steel: Application of electricity in mills, R 413; Capacity of U. S. Works, R 345; Census report, R 524; Corrosion of, R 98; Determination of arsenic in, R 485; Determination of manganese, 243, 1204; Internal strains of, R 84; New Canadian plant, R 388; New hot metal mixer, R 389; Protection of, R 81; Queer phenomenon in melting, R 489; The year's record at Pittsburg..... R 214
Iron ores: Antwerp and Fowler belt, New York, R 282; Briquetting, R 525; Of Georgia, R 6; Of Lake Superior, R 128, 147; Of Minnesota, R 282; Of Santiago, R 80; Lake Superior, annual review, R 211; Lake Superior, moisture in, R 525; Production in 1901, R 412; Source of Lake Superior, R 410; Statistics and analyses, ... R 73
IRVING, J. D. Deposits of wolframite in the Black Hills ..... R 204
IRWIN, WM. GILBERT. Briquetting iron ores and flue dust, R 525; Briquetting of fuels and fine mineral ores, R 346; The by-product coking industry, R 39; The development of industrial fuels, R 211; The year's record in iron and steel at Pittsburg. ..... R 214
Isoapiol, derivatives of 343, 345
Isoeugenol, derivatives of..... 345
Isomorphism of selenates and tellurates..... R 2
Isosafrol, derivatives of..... 339, 342
Isothiocyanates..... 439, 680, Y 21
Isovaleric aldehyde, action on antipyrine..... 1050
IVES, FREDERICK E. A photo-micrographic device..... R 485

JACOBS, CHAS. B. Manufacture of barium compounds in electric furnace, R 369; The electric furnace in industrial chemistry, R 353; Sulphuric acid by electrolysis .. .. R 506
JACOBS E. The Snowshoe Mine, B. C..... R 81
JAGGAR, THOMAS A. Field notes of a geologist in Martinique, etc..... R 449
JAGGAR, THOMAS AUGUSTUS, JR. The laccoliths of the Black Hills..... R 146
JAMES, J. H., and J. C. Ritchie. Analyses for electrolytic alkali works 469
JAMESON, GEORGE. See Henry L. Wheeler.
JEANS, J. S. The iron trade situation in Europe ..... R 214
JEFFERSON, ALICE MACMICHAEL. Aromatic bases as precipitants for rare earth metals..... 540
JOB, R. Steel rails, relations between structure and durability ..... R 492
JONES. C. H, and B. O. White. Composition of nitrogen-free extract matter in potatoes, R 400, 401; Miscellaneous analyses, R 402; Organic nitrogen availability of fertilizers ..... R 401
JONES, HARRY C. A redetermination of the atomic weight of lanthanum, R 437; The effect of certain poisons on inorganic ferments, R 421; The molecular weights of certain salts in acetone ..... R 264
JONES HARRY C., and F. H. Getman. Lowering of the freezing-point in concentrated solutions..... R 438
JONES. H. C., James Barnes, and Edward P. Hyde. Lowering of freezing-point of hydrogen peroxide ..... R 265
JONES, HARRY C., and James M. Douglas. The dissociation of certain acids, bases, and salts ..... R 263
JONES, L. Y. Killing weeds with chemicals..... R 401
JONES, WALTER, and G. H. Whipple. The nucleoproteid of the suprarenal gland. R 497
JOHNSON, D. WILSON. Geology of Valencia Co., N. M..... R 151
JOHNSON, E. M. Burette arrangement. 476
JOHNSON, P. An automatic system of sampling..... R 391

Digitized by Google

JOHNSON, TREAT B. See Henry L. Wheeler.
JOHNSON, WILLARD D. Geology of the High Plains.....R 149
JOHNSON, WOOLSEY McA. Theory of the Edison nickel iron cell.....R 279
JOHNSON, A. C. A 325 ton hot-metal mixer.....R 389
JORDAN, W. H., and F. A. Sirrine. Commercial fertilizers for onions.....R 247
JORDAN, W. H., and G. W. Churchill. Influence of manure on sugar beets.....R 247
JULIEN, ALEXIS A. On pyrite and marcasite.....R 385

KAHLENBERG, LOUIS. Instantaneous reactions and the dissociation theory, R 273; Nitriles as solvents in molecular weight determinations.....R 274
Kansas City section.....Pr 34; Pr 41
KASTLE, J. H. A study of tribromphenolbromide, R 227; The inactivity of lipase towards the salts of certain acid ethers, etc., R 439; The inactivity of lipase towards the salts of certain esters, etc.....R 496
KASTLE, J. H., and A. S. Loevenhart. Certain oxidizing ferments.....R 131
KASTLE, J. H., and Jewett V. Reed. The nature of mercuric iodide in solution.....R 266
KASTLE, J. H., and Mary E. Clarke. Decomposition of hydrogen peroxide at high temperatures.....R 117
KASTLE, J. H., and O. M. Shedd. Phenolphthalein as reagent for ferments.....R 131
KAUFFMAN, W. H. The losses of silver in cupelling.....R 462
KEARNEY, THOMAS H., and Frank K. Cameron. Alkali soils and vegetation.....R 246
KEBLER, LYMAN F. Rapid method for determining chromic acid.....R 207
KEITH, N. S. Continuous electrolysis of solutions of metals, R 527: Electrolytic recovery of copper from low-grade ores.....R 349
KEMP, GEORGE T. Relation of blood plates to number of red corpuscles.....R 230
KEMP, GEORGE T., and O. O. Stanley. Some new observations on blood plates.....R 230
KEMP, JAMES FURMAN. Distribution of the platinum group, R 286; Notes on platinum and associated metals, R 394; Recalculation of analyses of rocks.....R 118
KENNEY, E. F. Specifications for steel rails.....R 17
KENRICK, EDGAR B. Note on Reinsch's test..... 276
KENRICK, EDGAR B., and F. B. Kenrick. The application of polarimetry to estimation of tartaric acid..... 928
KENRICK, F. B. See Edgar B. Kenrick.
KERBY, J. ORTON. Gutta percha in the Philippines.....R 241
Kerosenes, thermal properties.....R 533
KERR, FRANK M. The sulphur deposits in Calcasieu Parish.....R 281
KERSHAW, JOHN B. Electrochemical industry..... R 20, 161, 221, 85
KEYES, CHAS. R. Contiguity of ore deposits.....R 4
KING, A. S. New peculiarities in the structure of the cyanogen bands.....R 444
KING, F. H., and A. R. Whitson. Development of nitrates in cultivated field soils, R 330; Studies on black marsh soil.....R 331
KINGMAN, WILLIAM A. (R). See James F. Norris.
KINNICUTT, LEONARD P. Present status of the sewage problem in England, R 327; The prevention of pollution of streams, etc.....R 504
KINNICUTT, LEONARD P., and H. P. Eddy. The action of the septic tank on acid iron sewage.....R 423, 470
KINSEY, A. T. See J. T. Willard.
KIRKCHAFFER, W. G. Relation of a fever epidemic to water supply..... R 240
KNAPP, MARK I. Butyric and acetic acids in stomach contents.....R 29
KNERR, E. B. A theory of the cosmos, R 72; The Muscotah Artesian wells.....R 72
KNIGHT, NICHOLAS. Analysis of Mount Vernon loess.....R 288
KNIGHT, W. C. Discovery of platinum in Wyoming, R 157; Occurrence of the rare metals in the Rambler mine, Wyoming, R 419; The petroleum fields of Wyoming, II, R 76; The Sweetwater mining district.....R 217
KNIGHT, W. C., and E. E. Slosson. Alkali lakes and deposits, R 192, 202; The Newcastle oil field, R 451; Various oil fields.....R 243
KNIPP, CHAS. T. The density and surface-tension of liquid air.....R 269
KNISELY, A. L. See J. Withycombe.

Digitized by Google

KNISELY, A. L. A study of the lupine plant ..... R 48
KNOCK, T. L. See R. H. Loughridge.
KOCH, WALDEMAR. On lecithin, etc., from nerve substance, R 535; Physiological action of formaldehyde.. ..... R 131
KOCH, W. E. Modern methods of gold extraction ..... R 217
KOHLER, ELMER P. Addition of organic oxygen compounds and aluminum halides ..... R 359
KOHNSTAMM, L. See H. C. Sherman.
KOHR, D. A. See A. A. Noyes.
KOLIPINSKI, LOUIS. Artificial milk ..... R 132
KOPP, FRANCIS T. Rapid volumetric method for molybdenum steel 187
KRAUS, H., and J. Reitinger. Hussakite, a new mineral, etc..... R 450
KUEBEL, S. J. Lithographic stone in U. S..... R 129
KUHARA, M., and M. Chikashigé. Methyl derivatives of indigo ..... R 225
KUHARA, M., and M. Fukui. Action of aromatic amines on phthalyl chloride..... R 90
KUMMER, F. A. Creosote blocks for pavements..... R 40
KUMMEL, HENRY B. The mining industry (New Jersey)..... R 453
KUNZ, GEO. F. Precious stones, R 74; Precious stones of Mexico..... R 79

LABORATORY, new government..... R 384
Laccoliths: In Montana, geology of, R 122; Of the Black Hills ..... R 146
LACHMAN, ARTHUR. On azoxybenzene..... 1178
Lactose, separation from maltose. 993
LADD, E. F. Report of the chemist .. .. R 376
Lakes of Northern Indiana and their marl deposits..... R 7
LAMAR, W. R. See W. J. Schieffelin.
LAMB, ARTHUR B. Conversion of ortho- into normal periodic acid..... R 200
LANDFIELD, J. B., JR. See C. W. Purington.
LANE, ALFRED C. Coal of Michigan ..... R 342
LANGENBECK, KARL. Character and value of aseptic flooring material..... R 366
LANGMUIR, P. Recording and interpreting foundry costs..... R 489
LANGWORTHY, A. E. The Atchison diamond drill prospect hole..... R 72
Lanthanum, atomic weight, 208, R 437; Precipitants..... 551
LAPHAM, M. H. See L. J. Briggs.
LATTA, W. C. Renewal of humus in corn culture..... R 192
Laurel, poisonous properties of..... R 322
Lauric acid, and some derivatives ..... R 531
LAWSON, ANDREW C. Feldspar corundum rock, California..... R 124
LAWSON, ANDREW C., and Charles Palache. Geology of the Berkeley Hills.... R 288
Lead, alloys with tellurium, R 199; Deposits of North Arkansas, R 82, 126; Deposits, Ozark region, R 206, 392; Electrical reduction of, R 526; Electrolytic deposition of, 435; Mining, R 219; Ores, Southeast Missouri, R 392; Separation from manganese, 439; Smelting in Southeast Missouri..... R 301
Lead thiocyanate..... 570
Lecithin, from nerve substance..... R 535
Lecture experiments, catalytic action..... 498
LEE, F. C., and C. C. Harrold. Rigor mortis ..... R 234
LEE, FREDERIC S., and William Salant. The action of alcohol on muscle, R 231, 533; Causes of muscle fatigue..... R 233
LEE, H. A. Mineral production of Colorado..... R 387
Leeds, Prof. Albert R. Obituary..... Pr 53
Legumin, sulphur in 147
LEITH, C. K. Geology of the Mesabi iron region..... R 297
LENGFELD, FELIX. A new proof of the formula $dT = 0.02T^2/L$, R 270; Applications to chemistry of J. J. Thomson's work, R 271; On gold halides..... R 1
LENGFELD, FELIX, and James H. Ransom, the influence of electrical waves on chemical action..... R 270
LENHER, VICTOR. Action of selenic acid on gold, 354; Natural telluride of gold, 355; Tellurium tetrachloride, 188. See also R. D. Hall.

Digitized by Google

LEONARD, ALFRED GRAY. The basic rocks of N. E. Maryland .....R 121
Lepidolite, determination of lithia in 392
LEROY, OSMUND EDGAR. Geology of Rigaud Mountain.....R 124
Leucite-tinguaite, Beemerville, N. J.....R 285
LEVENE, P. A. Embryo-chemical investigations, R 361; Preliminary communication on glucophosphoric acid, 190; The biological relationship of proteids.....R 133
LEWIS, GILBERT NEWTON. The law of physico-chemical change.....R 267
Librarian, annual report .....Pr 22
Lignite: briquettes, R 99; In Texas.....R 452
LILLIE, RALPH S. Effects of various solutions on muscular movement in larvae, R 320; On the oxidative properties of the cell-nucleus, R 467; The rôle of the cell nucleus in oxidation and synthesis .....R 232
Lime: Relation to plant growth, R 48; Requirements of soil 1129
Limestone: From Atchison prospect well, analyses, R 72; the Americus.....R 72
Limonene..... 650
LINDGREN, WALDEMAR. Tests for gold and silver in shales from Western Kansas, R 522; The gold belt of the Blue Mountains, Oregon.....R 150
LINN, A. F. Electrolytic deposition of lead..... 435
Linseed oil, metallic soaps from 215
Lipase, inactivity toward certain salts, R 439, 496; Relation to fat metabolism .....R 172
LIPMAN, J. G. Studies in nitrification..... 171
LIPPINCOTT, J. B. Development of water near San Bernardino, etc., California ....R 481
LISLE, JUSTIN D. The identification of human blood.....R 533
Lithium, determination in lepidolite, 392; Excretion of, R 231; Preparation of metallic..... 1024
Lithographic stone in U. S .....R 129
LOCKE, JAMES. Electro-affinity as a basic for systematizing inorganic compounds, R 266; The periodic system and properties of inorganic compounds, IV., R 445; Some double sulphates of thallium and caesium, R 341; The solubility of alums as a function of two variables.....R 263
LOCKE, WILLIAM W. Sanitary water inspection in Mass.....R 180
LOEB, JACQUES. Physiological effects of electrically charged molecules, R 361; physiological effect of the valency and electrical charges of ions .....R 173
Loess, analysis of Mount Vernon.....R 288
LOEVENHART, A. S. Relation of lipase to fat metabolism, R 172; See J. H. Kastle.
LOEW, OSCAR, and D. W. May. Lime and magnesia for plant growth .....R 48
LONG, J. H. On the electrical conductivity of urine, etc..... 996
LONGMUIR, PERCY. Cast iron .....R 459
LOUGHRIDGE, R. H. Tolerance of alkali by plants.....R 102
LOUGHRIDGE, R. H., T. L. Knock, and J. B. Davy. The Gooselands of Glenn Co., etc., Cal .....R 541
LOW, ALBERT H. The copper assay by the iodide method 1082
LUCKE, C. E. Liquid fuel combustion.....R 508
LUMIERE, and Seyewitz. Substitute for alkalies in developers.....R 242
LUNDIN, ANDRES G. Jupiter steel.....R 18
Lupine plant, study of .....R 48
LUSK, GRAHAM. Does dextrose arise from cellulose in digestion? R 231; On phlorhizin diabetes .....R 172
Lymph flow.....R 467
LYON, E. P. Effects of potassium cyanide on eggs of sea-urchin .....R 319
LYON, T. L., and A. T. Wiancko. Experiments in the culture of the sugar beet in Nebraska.....R 374
LYONS, R. E., and F. L. Shinn. The quantitative determination of selenium in organic compounds 1087

MABERY, CHARLES F. The composition of petroleum.....R 529, 531
MABERY, CHARLES F., and A. H. Goldstein. On the specific heats, etc., of certain hydrocarbons .....R 443
MACGREGOR, J. G. Depression of the freezing-point in aqueous solutions, etc.....R 439

Digitized by Google

MAGIE, WILLIAM F. The specific heat of solutions, III.....R 443
Magnesia, relation to plant growth, R 48; Water, Madison, Kan., analysis.....R 72
Magnesium, alloys with aluminum.....R 221
MAIGNEN, P. A. Water purification.....R 323
MALCOLMSON, J. W. Ore deposits of the Sierra Mojada.....R 14, 79
MALPEAUX. Fertilizing value of oil-cake.....R 192
Malt liquors, composition.....1170
Maltose, separation from lactose.....993
Manganese, colorimetric estimation, R 12; Determination in iron and steel, 243, 1204; ferrocyanides, 1023; In Brazil, R 122, 154; New departure in mining, R 492; Ores, R 128; Production of, R 526; Separation of lead from.....439
MANNING, CHARLOTTE R. See Francis G. Benedict.
MANSFIELD, E. R. See L. H. Merrill.
Marble, flow of.....R 279
Marcasite and pyrite, method of distinguishing.....R 9, 75, 385
MARKHAM, E. R. Case-hardening steel.....R 216
Marl: Deposits of Northern Indiana, R 7; Natural history of.....R 7
MARRIOTT, C. Nickel steel and magnetic observation.....R 415
MARSH, A. L. The possibilities of a light-weight storage battery.....R 426
Marsh-Berzelius method.....1005
MARTIN, GEO. CURTIS. See Wm. Bullock Clark.
MARTIN, H. J. Improved method of manufacturing copper, etc.....R 86
MARTIN, S. S. The structure of steel rails.....R 489
MARVIN, F. O. Water-supply from a sanitary standpoint.....R 72
MASON, F. H. Lignite and peat briquettes in Germany.....R 99
MATHER, WILLIAM T. New apparatus for determination of the relative velocity of ions.....R 264
MATHEWS, A. P. The nature of nerve stimulation.....R 317
MATHEWS, JOHN A. Alloys as solutions, R 163; The constitution of binary alloys, R 224. See William Campbell.
MATTHEWS, Albert P. Action of pilocarpine and atropine on embryos.....R 92
MATTHEWS, J. MERRITT. Influence of indigo red in indigo dyeing, R 315; The action of caustic soda on wool.....R 427
Maumené's test.....266
MAXWELL, HENRY V. Gold dredging in North Carolina.....R 80
MAXWELL, S. S. A case of voluntary erection of the human hair.....R 466
MAXWELL, S. S., and J. C. Hill. Effect of calcium, etc., on rhythmic contraction...R 467
MAY, D. W. See Oscar Loew.
MAYER, J. S. Fallacious test for glucose in cane-sugar syrup.....R 322
MCBAIN, J. W. The oxidation of ferrous solutions by free oxygen.....R 270
MCCALLIE, S. W. A preliminary report on iron ores of Georgia.....R 6
MCCHARLES, A. The nickel mines of Northern Ontario, R 416; The Sudbury nickel mines.....R 158
MCCAY, L. W. The interaction of sulphuretted hydrogen and arsenic acid.....661, R 201
MCDONALD, M. E. See C. B. Dudley.
MCFARLAND, DAVID F. See Edward Bartow.
MCILHINEY, PARKER C. Further notes on the bromine absorption of oils.....1109
MCINTOSH, D. Inorganic ferments.....R 274
MCLEOD, GRACE. See Jas. F. Norris.
MCMATH, R. E. Report on the St. Louis water supply by an expert Commission....R 326
MEAD, L. D., and William J. Gies. Study of the reactions of various mucoids.....R 232
MEANS, THOMAS H. Retention of salts near surface of soils.....R 135
MEANS, T. H., and J. G. Holmes. Soil survey in California.....R 192
Meats, preserved.....R 376
Medal, the John Fritz.....R 456
Melilite in Syracuse dike.....R 449
Members elected.....Pr 28, 38, 39, 45, 47, 52, 63, 73, 78, 81, 86, 95
Membership statistics for 1901.....Pr 19

Digitized by Google

MENDEL, LAFAYETTE B. Experiments on allantoin excretion, R 231; Observations on the vegetable proteolytic enzymes, etc.....R 465
MENDEL, L. B., and Donald R. Hooker. Lymphagogic action of the strawberry, etc.R 467
MENDEL, L. B., and Frank P. Underhill. Digestion of proteins.....R 27
MENDEL, L. B., and Leo F. Rettger. Observations on pancreatic digestion, etc.....R 463
Mercuric iodide, nature in solution.....R 266
Mercurous chloride, decomposition by dissolved chlorides.....R 267
Mercury, R 73; Arc lamp, R 96; At Trans-Pecos, Texas, R 205; Mining in California, R 220; World's production.....R 352
MERIGOLD, B. S. See T. W. Richards.
MERRIAM, HENRY F. See Henry L. Wheeler.
MERRILL, C. G. See H. M. Gordin.
MERRILL, FREDERICK J. H. Nineteenth Annual Report N. Y. State Geologist.
MERRILL, GEORGE P. A newly found meteorite from Admire, Lyon Co., Kansas, R 411; A stony meteorite from Felix, Ala., R 76; Rutile mining in Virginia, R 352; The non-metallic minerals.....R 77
MERRILL, GEO. P., and H. N. Stokes. New meteorites.....R 75
MERRILL, L. A. See J. A. Widtsoe.
MERRILL, L. H., and E. R. Mansfield. Cereal breakfast foods.....R 515
Mesitylene, polybasic acids of.....R 354
Metals, composite, electrolytic refining, R 526; Continuous electrolysis of solutions, R 527; Location by electricity, R 81; Prices since 1890, R 294; Structure.....R 486
Metallography in car wheel manufacture, R 299: nomenclature.....R 486
Metallurgical industries, census figures.....R 387
Metallurgical laboratories.....R 457
Metallurgists, education in Germany.....R 457
Metallurgy of the cupola.....R 490
Metamorphism, contact, physical effects of.....R 283
Metaphosphoric acid, rate of hydration.....R 265
Metatungstate, ammonium.....631
Meteorites, action of copper sulphate on, R 450; Catalogue of the National Museum collection, R 411; Composition, R 8; From Admire, Kansas, R 411; From Allegan Mich., and Mart, Texas, R 75; From Felix, Ala., R 76; From Kansas, R 451; Niagara, R 455; Pre-terrestrial history of, R 73; Studies of, R 482; The Casas Grandes, R 483; The Veramin, R 75; Unpublished Nebraska.....R 287
Methane, heat of dissociation and combustion.....R 268
Methyl alcohol, action on bromides of propenyl compounds, 327; toxicity of.....R 500
Methylene hydrocarbons, specific heat, etc.....R 443
Metric system.....R 445
METZGER, FLOYD J. A new separation of thorium.....275, 901
Mexican poppy.....238
MEYER, JOSEPH L. Lloyd reaction for morphine.....R 31
Mica: Andesite of Boulder Co., Col., R 71; Mining.....R 295
MICHAEL ARTHUR. Substitution processes in the fatty series, R 304; The addition-splitting-off law, R 306; The three stereomeric cinnamic acids.....R 168
MICHAELI, J. G. The manganese deposits of Gandarella.....R 154
Michigan Section.....Pr 49, 67
Milk, artificial, R 132; Average composition, R 247; Creaming during sale, 1136; formation of films on, R 465; Liberation of sulphide on heating, R 173; Mixtures, R 28; Testing Babcock bottles.....R 401
MILLER, EDMUND H. Ferrocyanides of cadmium.....226
MILLER, E. H., and J. L. Danziger. On the composition of the ferrocyanides of zinc 823
MILLIGAN, ROBERT E. Mechanical filtration of water.....R 425
MINDERMANN, F. W. E. The revival of iron mining in New Jersey.....R 213
Mineralogy, Canadian report, R 384; North America, bibliography for 1901.....R 524
Minerals, additions to alunite-jarosite group, R 456; Briquetting, R 346; California, R 124, 125; Canadian, R 9; Exhibits at Pan-American, some Southern, R 80; Of New South Wales, R 15; The Black Hills, R 385; The non-metallic, R 77; Univ. of Texas survey, R 295; Unusual, Pacific States, R 343; U. S. exports, R 488; U. S. export trade in 1901, R 295; Vein formation in Montana.....R 144

Digitized by Google

Mineral production : California in 1901, R 487 ; Canada, R, 345 ; Colorado, R 387 ; U. S. in 1901, R 486 ; World .....R 345
Mineral resources of Pahary, Malay Pen., R 80 ; Of South Dakota, R 481 ; Of Texada Island B. C., R 80 ; Of the United States, 1899, R 73, 74 ; Of the U. S., 1900.....R 128
Mineral veins, influence of country rock on,..... .....R 204
Mines, at St. Louis World's Fair, R 209, 486 ; Kansas, R 72 ; Keystone hydraulic, R 13; Morro Velho Gold, R 15 ; Report of Ontario Bureau, R 77 ; Sudbury nickel, R 352 ; The Sierra Mojada, R 79 ; The Snowshoe, B. C., R 81 ; Toponah Lake, Nevada..R 155
Mining, Boundary district, B. C., R 416 ; Concentration practice, R 219; Copper in Japan, R 158 ; Cripple Creek district, R 79 ; Electricity in, R 351 ; Glossary of terms, R 78 ; In Brazil, R 15 ; Gold in E. Ontario, R 217 ; In British Columbia, R 15; In Gilpin Co., Col.. R 79 ; In Newfoundland, history of, R 9 ; In Malay Peninsula, R 158 ; In Mexico, old time, R 81 ; In New Jersey, R 453 ; In Southeast Missouri, R 81 ; In Spain, R 14 ; In the Transvaal, R 16, 156 ; In the U. S. in 1901 ; Iron in New Jersey, R 213 ; Lake Superior interests, R 295 ; Nome region, R 416 ; Of Mexico. R 13 ; Republic District, Washington, R 494 ; The Ketchikan district, Alaska, R 80 ; The Russian law for gold, R 156 ; The San Juan mills, R 217 ; The Sweetwater district, R 217 ; Upland placers in Mexico, R 217 ; Zinc and lead in S. W. Missouri.....R 219
Mining Engineers, Mexican meeting of American Institute.....R 78, 209
Mining industries in Germany, R 152 ; Of Mexico .....R 79
Mining School, the Australian..... .....R 79
Minting machinery.....R 162
Minutes of 25th General Meeting. .....Pr 13
Mixed crystals of copper and zinc sulphates.... .....R 2
Mixer, the Jones patent.....R 413
MIXTER, W. G. Heat of dissociation and combustion of acetylene, ethylene and and methane.....R 268
MOAT, CHARLES P. Water supplies of Vermont .....R 176
MOECHEL, J. ROBERT. Food preservatives, use and abuse.....Pr 42
Mohawkite.....R 416
MOISSAN, HENRI. New oven heated by the oxyhydrogen blowpipe, etc., R 522 ; Hydride of potassium.....R 201
Mold, influence on composition of butter, 711 ; Prevention on cigars .....R 514
MOLDENKE, RICHARD. Proc. of Int. Ass'n for testing materials, R 16 ; Accuracy and value in the testing of cast iron, R 489 ; Foundry economy .....R 349
Molding, new process.....R 488
Molecular weights, nitriles as solvents, R 274 ; Of salts in acetone, R 264 ; Of some carbon compounds.....R 268
Molybdic acid, estimation of .....R 130
Molybdenum, R 74 ; determination of, in steel..... 273
Molybdenum steel, rapid volumetric method 186
MONAGHAN, J. J. The education of metallurgists in Germany .....R 457
Monazite, occurrence in iron ore and graphite, R 205 ; New separation of thorium in. 901
MOODY, SETH E. See Charles A. Peters.
MOORE, ANNE. Effects of solutions upon rigor mortis and heat rigor, R 321 ; On the power of sodium sulphate to neutralize the ill effects of sodium.
MOORE, B. E. The absorption spectrum of colloid ferric hydroxide.....R 269
MOORE, BENJAMIN, and Wm. H. Parker. The osmotic properties of colloidal solutions.....R 362
MOORE, C. C. A plan for coöperating in the study of available plant food, R 373 ; Available mineral plant food in soils..... 79
MOORE, FREDERICK. Gold in North Carolina .....R 288
MOORE, RUSSELL W. The composition of commercial cyanide of potassium .....R 369
Moore, W. E. Creosoting wooden poles for electric line work.....R 426
MORLEY, EDWARD W. A new gauge for the measurement of small pressures.....R 445
Morphine : Does Argemone Mexicana contain it ? 238 ; Lloyd reaction for.....R 31
MORSE, F. W. The value of meadow muck .....R 102
MORSE, H. N., and J. C. W. Frazer. The preparation of osmotic pressure cells ....R 438

Digitized by Google

Mortars, silica cement.....R 101
MORTON, D. A. See J. D. Pennock.
Mucoids, reactions, R 232; Tendon.....R 29
MUNSON, L. S. See L. M. Tolman. See W. D. Bigelow.
MURPHY, V. C. GEN. The Trans-Caucasian pipe line.....R 187
Muscle, action of alcohol on, R 231; Fatigue, causes of.....R 233
Muscular movement, effects of solutions on.....R 320
Muscular soreness.....R 319
MYERS, HENRY C. The sugar beet as a reclaimer of arid regions, R 512; Substitution of hydrogen for chlorine in trichlormethylparaconic acid..... 525
MYERS, WILLIAM S. Chlorine in natural waters.....R 453

NAGEL, OSKAR. Ricinus oil-cake.....R 248
NAISER. Destruction of weeds by chemical products.....R 191
Names proposed for associate membership.....Pr 8, 30, 38, 45, 52, 62, 73, 78
Names proposed for membership.....Pr 6, 28, 37, 45, 47, 51, 62, 73, 77, 81
NAMIAS, R. The action of chromates and bichromates on colloids.....R 242
Naphthas, thermal properties.....R 533
NARDIN, E. W. Copper mining in Japan.....R 158
NASON, F. L. The disseminated lead ores of Southeast Missouri.....R 392
NAYLOR, WILLIAM. The bacterial treatment of trade waste.....R 503
NEALE, A. T., and C. L. Penny. Sugar-beets and sorghum in Delaware.....R 541
NEF, J. U. Dissociation of monatomic alcohols, etc.....R 164
Neodymium, atomic weight, 209; Precipitants..... 553
Nepheline, in Ontario, R 450; Rocks in B. C.....R 453
Nernst lamp.....R 100
Nerve stimulation, its nature.....R 317
NEUBERGER, HENRI. Geology and origin of petroleum.....R 152
New apparatus, 535, 476, 246, 388, 391.....R 264
NEW BOOKS. A Bibliography of the Analytical Chemistry of Manganese (Talbot and Brown) 694; Acht Vorträge über Physikalische Chemie (J. H. van't Hoff), 1217; A Compendium of Gold Metallurgy and Digest of U. S. Mining Laws. Water Rights (E. M. and M. L. Wade), 199; A Laboratory Guide in Elementary Bacteriology (W. D. Frost), 595; A Laboratory Manual of Physics for Use in High Schools (H. Crew and R. A. Tatnall) 696; American Handy-Book of the Brewing, Malting and Auxiliary Trades (R. Wahl and M. Henius), 196; American Standard Specifications for Steel (A. L. Colby), 592; Ammonia and its Compounds—Their Manufacture and Uses (C. Vincent), 698; Analyse des Engrais (D. Siderski), 192; An Introduction to Chemical Analysis for Students of Medicine, etc. E W. Rockwood), 287; Annuaire pour l'an 1902 (publie par le Bureau des Longitudes), 281; A Short Manual of Inorganic Chemistry (A. Dupré and H. Wilson Hake), 194; A Text-Book of Inorganic Chemistry (A. F. Holleman), 693; A Travers la Matière et l'Energie (F. E. Blaise), 585; Chemical Lecture Experiments (F. G. Benedict), 195; Congrès Internationale d'Electricité, Paris, 1900 (M. E. Hospitalier), 1222; Drying Oils, Boiled Oil, and Solid and Liquid Dryers (L. E. Andes), 488; Elementary Electricity and Magnetism (D. C. Jackson), 480; Enzymes and Their Application (Jean Effront), 480, Experiments on Losses in Cooking Meats (H. S. Grindley), 285; Gas and Fuel Analysis for Engineers (A. H. Gill), 3rd edition, 692; Grundriss der Qualitativen Analyse vom Standpunkte der Lehre von den Ionen (W. Böttger), 898; Grundzüge der Siderologie, zweiter theil (H. F. von Jüptner) 593; Guide to Preparation Work in Inorganic Chemistry (Blochmann), 1140; Handbook of Technical Gas Analysis (C. Winkler), 1219; Handbook on Sanitation (G. M. Price), 196; History of the Development of Chemistry since Lavoisier (A. Ladenburg), 284; Indicators and Test Papers (A. I. Cohn), 2nd edition, 693; Induction Coils (H. S. Norris), 283; Inorganic Chemistry, with the Elements of Physical, etc., Chemistry (J. I. D. Hinds), 1216; Jahrbuch des Verein der Spiritus-Fabrikanten in Deutschland, etc., 695; Laboratory Companion to Fats and Oils Industries (J. Lewkowitsch), 293; Leçons sur la Theorie des Gaz (L. Boltzmann), 484; Leitfaden für den Unterricht in der Anorganischen

Digitized by Google

Chemie, zweiter theil (J. Sperber), 197; Les Carbures d'Hydrogène, 3 vols. (Berthelot), 289; Logarithms of Numbers and Chemical Factors (C. R. Sanger), 286; Manual of Qualitative and Quantitative Analysis with the Blowpipe (Plattner), 696; Methods for Analysis of Ores, Pig Iron and Steel (ed. F. C. Phillips), 288; Methods of Chemical Analysis and Foundry Chemistry, by Frank L. Crobaugh, 116; Methods of Gas Analysis (W. Hempel), 1220; Modern Chemistry, two parts (Wm. Ramsay), 282; Modern Chemistry, with its Practical Applications (F. N. Peters), 783; Notes on Lead Ores (James Fairie), 692; On Cane-Sugar and the Process of its Manufacture in Java (H. C. P. Goerligs), 1138; On the Composition of Dutch Butter (J. J. L. van Ryn), 277; Outlines of Electrochemistry (H. C. Jones), 486; Refrigeration, Cold Storage, and Ice making (A. J. Wallis-Taylor), 781; Reprints of Science Classics No. 1, Analysis of Air and Water (Lavoisier), 481; Research Papers from the Kent Chemical Laboratory of Yale University (ed. F. A. Gooch). 195; Sewage and the Bacterial Treatment of Sewage (Samuel Rideal), 587; Sewage Works Analysis (G. J. Fowler), 1221; Smokeless Powder, Nitrocellulose, and the Theory of the Cellulose Molecule (J. B. Bernadou), 198; Studien zur Kentniss, etc. (copy from page 482); Studies from the Chemical Laboratory of Sheffield Scientific School (ed. H. L. Wells), 398; Subject List of Works on Chemistry and Chemical Technology, British Patent Office, 198; The American Yearbook of Medicine and Surgery for 1902, Vol. I., 693; The Chemical Essays of Charles William Scheele, 280; The Chemistry of the Terpenes (F. Heusler), 1218; The Dyeing of Cotton Fabrics (Franklin Beech), 282; The Elements of Physical Chemistry (H. C. Jones), 588; The Elements of Physical Chemistry (J. L. R. Morgan), 485; The Elements of Qualitative Analysis (W. A. Noyes), 292; The Experimental Study of Gases (M. W. Travers), 482; The Gas Engineer's Laboratory Handbook (John Hornby), 1139; The Letters of Berzelius and Schönbein (ed. G. W. A. Kahlbaum), 584; The Manufacture of Alum and the Sulphates and Other Salts of Alumina and Iron (Lucien Geschwind), 278; The Manufacture of Mineral and Lake Pigments (J. Bersch), 484; The Manufacture of Paint (J. C. Smith), 483; The Mineral Industry: Its Statistics, etc. (ed. J. Struthers), 1212; The Practical Methods of Organic Chemistry (Ludwig Gattermann), 286; Thermodynamique et Chemie (P. Duhem), 780; Vorlesungen ueber Theoretische und Physikalische Chemie, Heft I. (J. H. van't Hoff), 279; Water Supply (W. P. Mason), 3rd edition 691

New York section ..... Pr 58, Pr 100

Newberry, S. B. Portland cement, R 74; In U. S ..... R 129

Newland, D. H. Serpentines of Manhattan Island ..... R 126

Newsom, J. F. See J. C. Branner.

Nichols, J. Clayton. The Pigholugan and Pigtao gold regions ..... R 80

Nicholson, John T. See Frank D. Adams.

Nickel, alloys with aluminum, 257; Aluminum alloys, R 158; In Sudbury pyrrhotite, R 415; International Company, R 394; Mines, the Sudbury, R 158; Ontario mines, R 416; In Sudbury, Can., R 220; Organic salts in solution, 1012; Production in 1901, R 415; Steel, and magnetic observation, R 415; Applications, R 17; Sudbury district ..... R 352

Nikaido, Yasujuro. A volumetric method for the estimation of sulphuric acid, etc 774

Nishkian, Petros F. Cotton-seed oil and its uses ..... Pr 42

Nitranilines, condensation of chloral with 1063

Nitrates in cultivated soils ..... R 330

Nitrification of ammonium sulphate, Pr 11; In different soils, 528; Studies in 171

Nitriles, as solvents in molecular weight determinations ..... R 274

Nitro compounds, reduction of 1052

Nitrosobenzaldehydes 1059

o-Nitrobenzonitrile 1035

p-Nitrobenzyl chloride 1062

Nitrogen; apparatus, 388; Apparatus, modified bulb tube for, 248; Atomic weight, 201; Determination, R 537; Excretion during nervous excitement, R 172; Fixa-

Digitized by Google

tion by alfalfa, 1155; Organic.....R 43
Nitrogenous bodies, separation of.....R 538
Nitroglycerine, discovery of, in an exhumed body 18
Nitromethylphenylether 1201
Nitropyromucic acid .....R 313
NOGUCHI, HIDEYO. See Simon Flexner.
NORDEN, K. The theory of the electric rectifier .....R 277
NORRIS, GEORGE L. The determination of silicon in ferro-silicon, R 484; The determination of arsenic in iron and steel.....R 485
NORRIS, JAMES F. Isomorphism of selenates and tellurates, R 2; The chemistry of the purine group .....R 89
NORRIS, JAS. F., and Grace McLeod. On the preparation of triphenylmethane...R 168
NORRIS, JAS. F., and Erik H. Green. Condensation of carbon tetrachloride with benzene derivatives, R 170; New derivatives of secondary butyl alcohol.....R 87
North Carolina section ..... Pr 9, 66, 99
NORTH, E. P. Asphalt pavements in New York.....R 101
NOVY, FREDERICK G. See Paul C. Freer.
NOYES, A. A., and D. A. Kohr. The solubility equilibrium between silver chloride, etc..... 1141
NOYES, A. A., and G. V. Sammet. Lecture experiments illustrating catalytic action, 498; The equivalent conductivity of the hydrogen ion, etc..... 944
NOYES, WILLIAM A. What are the requirements of a course in technical chemistry R 508
NOYES, WILLIAM A., and G. Harry Clay. Determination of manganese in iron..... 243
Nucleic acid, of wheat embryo.....R 534
Nucleoproteid of suprarenal gland.....R 497

OGILVIE, I. H. An analcite-bearing camptonite from N. M.....R 454
O'HARRA, CLEOPHAS C. The mineral wealth of the Black Hills, R 385; Geology of Allegany County, Md., R 9; See Wm. B. Clarke.
OHLY, J. Manufacture of citric acid, R 243; Preparation of vanadium and uranium compounds .....R 19
Oils, bromine absorption of, 1109; Constants of little known, 691; Cotton-seed, Pr 42; Cotton-seed, Halphen's test, 1148; Fatty, relation of heat of combustion to S. G., 348; In seeds of Lindera benzoin, R 531; Lavender, adulteration with salicylic acid, 1027; Milfoil, 778; Maumené's test, 266; Neatsfoot, constants, 466; Red elderberry, 771; Salad, refractive indices, 754; Tallow, constants, 466; Test for gumming quality, 467; The Bechi test for cottonseed, 397; The Bechi test on olive 396
Oil cake, ricinus .....R 248
Oil, horse, constants 466
Oleomargarine, influence of mold on composition 711
OLIPHANT, F. H. Petroleum, R 74; Petroleum of U. S.....R 129
OLIVEIRA, F. DE PAULA. The diamond deposits of Salobro, Brazil .....R 77
Oölite for Portland cement.....R 8
Oölitic limestone industry in Indiana .....R 8
Ores, automatic sampling, R 391; Deposits, Elkhorn mining district, Montana, R 283; Deposits, genesis, R 203; Deposits, geology of, R 68; Deposits, Monte Christo, Wash., R 453; Deposits of different generic relationship, contiguity of R 4; Deposits of the Sierra Mojada, R 14; Deposits, Rico Mountains, Col., R 285; Dry crushing of, R 486; handling at furnaces, R 347; Handling plant at Homestead, R 83; talcose, treatment of slimes from.....R 494
ORTON, EDWARD. Petroleum and natural gas in New York. .....R 281
OSBORNE, THOMAS B. A hydrolytic derivative of edestin, etc., 28; Formation of sodium carbonate and hydrochloric acid in animal sulphur in protein bodies, 140; The basic character of the protein molecule, etc 39
OSBORNE, THOMAS B., and I. F. Harris. The nucleic acid of the wheat embryo ..R 534
Osmotic pressure cells, preparation of .....R 438
Osmotic properties of colloidal solutions .....R 362
Osseoalbumoid .....R 466

Digitized by Google

Ovalbumin, sulphur in 159
Oven, a new ..... R 522
Ovovitellin, sulphur in 157
Oxonium compounds ..... R 529
Oxygen, effect on animal life, R 93; Effect on rhythmic contraction, R 467; Pictet's separation process, R 67; Quadrivalent ..... R 359
Oxyhemoglobin, sulphur in 156
Oxyhydrogen blowpipe, oven heated by ..... R 522

PALACHE, CHARLES. See Andrew C. Lawson. See John E. Wolff.
PALMER, A. DE FOREST, JR. The dielectric constant of dilute solutions ..... R 276
PALMER, ARTHUR W., and William M. Dehn. Primary arsines ..... R 171
Pancreas, physiology, R 498; Relation to spleen ..... R 231
Pancreatic ferment, influence of chemical compounds on ..... R 498
Papain, R 465; For digestion of proteids ..... R 27
Paper manufacture, analysis of spent liquor from 235
Paraffins, dielectric constant, R 275; Specific heat, etc ..... R 443
Paratungstate, ammonium 630
Paris green, etc., analyses of ..... R 248
PARKER, EDW. W. Quicksilver, R 73; Sulphur and pyrites ..... R 74
PARKER, WM. H. See Benjamin Moore.
PARR, S. W. Note on the volumetric determination of copper, 580; the peroxide calorimeter, as applied to coals and petroleum 167
PARSONS, CHARLES L. The identification and composition of malt liquors 1170
PARSONS, CHARLES L., and M. A. Stewart. The retention of arsenic by iron, etc ... 1005
PARSONS, H. DEB. See J. M. Woodbury.
Parthogenesis, artificial, in annelids ..... R 422
PASEA, CHARLES M. On the relative bulk of weak aqueous solutions of certain sulphates, etc ..... R 439
PATRICK, G. E. Methods used in detecting process butter ..... Pr 32
PATRICK, G. E., and D. Stuart. Starch and glucose in butters ..... Pr 35
PATTERSON, H. J., and T. H. White. Soils and fertilizers for greenhouse crops ... R 373
Peat briquettes ..... R 99
PECK, F. B. Serpentine and talc at Easton, Pa ..... R 126
PECKHAM, S. F. Cement for a modern street ..... R 189
Pegmatite in Georgia granite ..... R 342
PENCE, WM. D. The coefficient of expansion of concrete ..... R 189
PENFIELD, S. L. See H. L. Wells. See W. F. Hillebrand.
PENFIELD, S. L., and W. E. Ford on calaverite ..... R 123
PENNOCK, J. D., and D. A. Morton. Commercial aqua ammonia 377
PENNY, C. L. Soil analyses, R 541; See A. T. Neale.
Peptone, Witte's combination with formaldehyde, R 363; Witte's, dissociation and compounds ..... R 364
PERCY, C. M. The British coal question ..... R 211
Periodic acid, conversion of ortho into normal ..... R 200
Periodic law, mathematical expression of, 270; And properties of compounds .... R 445
PERKINS, GEORGE H. Determination of copper by aluminum foil 478
Perknite (lime magnesia rocks) ..... R 7
Persulphates, determination ..... R 12
PETERS, CHARLES A., and Seth E. Moody. Determination of persulphates ..... R 12
Petrography, development in 19th century, R 454; Dikes in Syracuse, N. Y., R 449; The John Day Basin ..... R 523
Petrology, recent progress in ..... R 384
Petroleum, R 74; As fuel, R 42, 95, 161, 185, 186; At Trans-Pecos, Texas, R 205; Beaumont, free sulphur in, R 288; Composition of, R 529, 531; Fields of Wyoming, Ill., R 76; Geology and origin, R 152; In Louisiana, R 455; In New York, R 281; Of U. S., R 129; Peroxide calorimeter applied to, 167; Texas, R 77; Texas field, R 151; The Beaumont field, R 412, 243; The Newcastle field, R 451; Trans-Caucasian pipe line, R 187; Wyoming fields ... R 243

Digitized by Google

Phaseolin, sulphur in 151
Phase rule and analytical chemistry, R 440; Application to fusing-points of copper, etc. ..... R 440
Phases, solid, synthetic analysis of ..... R 440
PHELPS, C. S. An experiment on soil improvement, R 330; Field experiments with fertilizers, R 329; Pot experiments with nitrogenous fertilizers ..... R 330
Phenolphthalein, reagent for ferments ..... R 131
Phenoxozone derivatives ..... R 24
Phenylurazole, constitution ..... R 308
Phenylether, derivatives 1200
Pheuylhydrazine, action on certain esters ..... R 356
Philadelphia section ..... Pr 84
PHILLIPS, WM. B. Removal of iron from zinc blende, R 82; Texas petroleum, R 77; The Univ. of Texas mineral survey, R 295; The iron resources of Texas ..... R 388
Phlorhizin diabetes ..... R 30, 172
Phosphate metabolism ..... R 318
Phosphate rocks, Arkansas ..... R 524
Phosphates, significance in natural waters, 735; Tennessee white, R 149; the Florida trade ..... R 295
Phosphatic slag in agriculture ..... R 42
Phosphor bronze for hydraulic castings ..... R 493
Phosphoric acid, determination, R 44, 537; New researches on neutralization of, R 68; In fertilizers, determination, 895; Fixation in soil 1114
Phosphorizing metals ..... R 493
Phosphorus, determination in organic materials, 1100; Determination in plant substances, 1093; Production of ..... R 509
Photography, more light in the dark room, R 370; Blue-prints and black-prints .. R 396
Photo-micrographic device ..... R 485
Phthaleins, recent work on ..... Pr 10
Phthalyl chloride, action of aromatic amines on ..... R 90
Physiological effects of electrically charged molecules ..... R 361
Physico-chemical change, law of ..... R 267
PIERCE, S. J. The Cleveland water supply tunnel ..... R 122
PIERSON, GEO. S. The septic tank system at Fond du Lac ..... R 237
Pigment, a new iron ..... R 300
Pilocarpine, action on embryos ..... R 92
Pinene 649
PINGREE, M. H. See William Frear.
PIRSSON, L. V. See W. H. Weed.
Plant food, co-operation for study of, R 373; Trials ..... R 329
Plaster of Paris as a flux ..... R 352
Platinum, alloys with aluminum, 256; Distribution, R 286, 394; In B. C., R 220; In U. S., R 128; In Wyoming ..... R 157
PLOWMAN, A. B. Relations of plant growth to ionization of the soil ..... R 513
PLUMMER, JOHN. Iron in New South Wales ..... R 154
Polarimetry, in estimation of tartaric acid 928
Polarization of fruits, jellies, etc 515
POND, F. J., E. S. Erb and A. G. Ford. Action of alcohols on propenyl compounds . 327
POND, G. G. Discovery of nitroglycerine in an exhumed body 18
PORTER, FRED. B. Analyses of limestone from the Atchison prospect well ..... R 72
PORTER, H. F. J. Steel forgings for factory engines ..... R 84
Portland cement, R 7, 74; Clinkering of, 969; In Michigan, R 454; In New Jersey, R 127; In U. S., R 129; Manufacture and chemistry of, Pr 43; New plant, R 39; oölite for manufacture, R 8; Report of sub-committee on uniformity in analysis, R 289; Rotary kiln process ..... R 100
POSNER, E. R., and William J. Gies. Are proteids combined with fat or fatty acids? R 233; Experiments to determine admixture of fat with proteids ..... R 465
POST, J. W. Corrosion of steel rails by sea-water ..... R 98

Digitized by Google

Potash, determination, R 537; In fertilizers.....R 43
Potassium, estimation as pyrosulphate, R 11; Cyanide, composition of commercial, R 369; Ferric chloride, use for solution of steel, 1076; Permanganate, estimation of copper by, 708; Hydride.....R 201
Potatoes, nitrogen-free extract matter.....R 400
Praseodymium, atomic weight, 209; Precipitants.....552
PRATT, JOSEPH HYDE. Abrasive materials in U. S., R 129; A supposed meteoric iron, R 120; Occurrence of corundum in the U. S., R 127; Review of chemical constitution of tourmaline, R 119; Tungsten, molybdenum, etc.....R 74, 128
Precious stones, R 74; Of Mexico.....R 79
PRESCOTT, A. B., and J. O. Schlotterbeck. Scopula vs. belladonna.....R 234
PRESTON, H. L. Niagara meteorite.....R 455
PRITCHETT, C. W. Ancient copper smelting in Mexico.....R 300
Producer gas, chemistry of.....R 95
Propenyl compounds, bromides, action of alcohols on.....327
Prospecting in Mexico.....R 78
Proteids, biological relationship of, R 133; Cleavage products in liver, R 361; Combination of fat with, R 233, 465; Digestion with papain, R 27; Effects of injecting, R 316; In milk mixtures, R 28; Sulphur in.....140
Protein molecule, basic character of.....39
Protopine, 4 (fig), 13, R 30, 31; In Argemone Mexicana.....242
Pseudothioureas, some acetyl and benzoyl.....R 89
PULMAN, O. S., JR. See F. A. Gooch.
Purine group, chemistry of.....R 89
PURINGTON, C. W., and J. B. Landfield, Jr. The gold-dredging fields of E. Russia, R 156; The Russian gold mining law.....R 156
Pyridine, compounds of, 360; In aqua ammonia.....385
Pyrimidine, derivatives of.....R 224
Pyrite and marcasite, method of distinguishing.....R 9, 75, 385
Pyroracemic acid, electrolytic study of.....719
Pyrrodiazole derivatives.....R 356

QUENEAU, A. L. The gold sands of Cape Nome.....R 495
QUICK, ALFRED M. Sanitary protection of water, Baltimore.....R 178

RADIUM rays, physiological action of.....R 132
RALSTON, J. C. Notes on the Republic District, Washington.....R 494
RAMAGE, A. S. A new iron pigment.....R 300
RAMAGE, HUGH. See W. N. Hartley.
RAMSAY, W. Inert constituents of the atmosphere.....R 3
RANSOM, JAMES H. See Felix Lengfeld.
RANSOME, FREDERICK L. Ore deposits of the Rico Mountain, Col., R 285; Recent progress in petrology, R 384; Report on the economic geology of the Silverton Quadrangle.....R 383
Rare earths, yttrium group.....401
Rare earth metals, aromatic bases as precipitants for.....540
Rare metals, occurrence in Wyoming.....R 419
REED, JEWETT V. See J. H. Kastle.
Refuse crematory for N. Y. City.....R 369
Reinsch's test.....276
REITINGER, J. See H. Kraus.
Retorts, evolution of metallic.....Pr 34
RETTGER, Leo F. Relation between the spleen and the pancreas, R 231; The formation of films on heated milk, R 465; The liberation of volatile sulphite from milk on heating, R 173. See L. B. Mendel.
RHODIN, B. E. F. Electrolytic manufacture at Sault Ste. Marie, Ont.....R 371
Rhodium, wave number system for.....R 444
RICE, EDGAR W. See Everhart P. Harding.
RICHARDS, A. N. See C. A. Herter.
RICHARDS, A. N., and William J. Gies. Chemical studies of elastic tissue.....R 318

Digitized by Google

RICHARDS, JOSEPH W. The American Electrochemical Society..... 581
RICHARDS, THEODORE W. A redetermination of the atomic weight of calcium, 374; A table of atomic weights of 77 elements, R 437; Modifications of Hempel's gas apparatus, R 294; Note on the application of the phase rule, etc., R 440; The significance of changing atomic volume, II. and III.....R 441
RICHARDS, T. W., and B. S. Merigold. The atomic weight of uranium.....R 268
RICHARDS, T. W., and E. H. Archibald. The decomposition of mercurous chloride by dissolved chlorides .....R 267
RICHARDS, THEODORE W., and G. W. Heimrod. On the accuracy of the improved voltameter .....R 442
RICHARDS, T. W., and Sidney K. Singer. The separation of hydrochloric and hydrocyanic acids.....R 387
RICHARDSON, CLIFFORD, and E. C. Wallace. Free sulphur in Beaumont petroleum .....R 288
RICKARD, T. A. Minerals of New South Wales, R 15; The saddle reefs of Bendigo .....R 281
RIDGAWAY, C. B. Experiments in evaporation.....R 510
RIDSDALE, C. H. Effect of work upon steel.....R 18
RIES, HEINRICH. Report of the clays of Maryland, R 410. See Wm. B. Clarke.
Rigor mortis, R 234; Effects of solutions on.....R 321
RITCHIE, J. C. See J. H. James.
ROBERTS, E. W. Gas engines—fuel mixtures.....R 99
ROBERTSON, J. D. Glossary of mining and smelting terms .....R 78
Rock analysis, methods .....R 481
Rock cement, American .....R 74
Rocks, andesitic, in Colorado, R 123; Basic, of N. E. Maryland, R 121; foyaite-ijolite series, R 119; Granitic, of Georgia, R 120; Granitic, weathering of, R 123; Igneous, Eastern Siberia, R 204; Igneous, grain of, R 344; Recalculations of analyses of, R 118; Volcanic, of Martinique.....R 447
ROCKWELL, C. The Coos Bay coal fields .....R 296
ROCKWELL, GEORGE W. An electrolytic study of pyroracemic acid 719
ROE, J. P. Puddled iron and mechanical means for its production .....R 413
ROEBER, E. F. Theory of the Edison nickel iron cell.....R 277, 279
ROHN, OSCAR. Copper deposits in Alaska .....R 146
ROPES, LEVERETT S. Montana corundum.....R 160
ROTH, G. Ammonal, a new high explosive.....R 241
ROWE, ALLAN W. See Augustus H. Gill.
ROWE, R. B. See Wm. B. Clarke.
Rubber, substitute for .....R 98
Rubidium, estimation as acid sulphate.....R 11
RUDISCH, JULIUS, and Leopold Boroschek. Determination of uric acid in urine..... 562
RUSBY, H. H. Poisonous properties of mountain laurel .....R 322
RUSSELL, ISRAEL C. Geology and water resources, Nez Perce Co., Idaho, R 125; The Portland cement industry in Michigan, R 454; The recent volcanic eruptions in the West Indies, R 447; See Robert T. Hill.
Rutile mining in Virginia .....R 352

SADLIER, J. G. Heat treatment of cast iron.....R 216
SADTLER, SAMUEL P. Recent advances in the fire proofing of wood.....R 506
SADTLER, S. S. A method of electrolytic production of zinc from its ores.....R 526
SALANT, WILLIAM. The action of alcohol on muscle, R 533; See Frederic S. Lee.
Salicylic acid, adulterant in lavender oil 1027
Saline deposits of California .....R 481
SALOM, P. G. The electrical reduction of lead .....R 526
Salt, Louisiana rock.....R 160
SAMMET, G. V. See A. A. Noyes.
Sampling, automatic 391
SANDERSON, R. P. C. Treatment of water for locomotive use .....R 138
Sanguinarine .....15, R 30

Digitized by Google

Sanitary Association, the New Jersey ..... R 178
Saponin, action on corpuscles ..... R 316
SARGENT, GEORGE W. The use of potassium-ferric chloride for the solution of steel 1076
SAYLOR, CHARLES F. Progress of the beet sugar industry in U. S. in 1901 ..... R 512
SCHAEFER, J. V. The washing of bituminous coal by the Luhrig process ..... R 295
SCHIEFFELIN, W. J., and W. R. Lamar. Determination of lithia in lepidolite 392
SCHLOTTERBECK, J. O. Chelidoxanthin probably impure berberine, R 235; Contribution to chemistry of stylophorum diphyllum, 1; Does Argemone Mexicana contain morphine? 238. See A. B. Prescott.
SCHLUNDT, HERMAN. The dielectric constants of pure solvents ..... R 275
SCHNELL, JOHN F. See Francis G. Benedict.
SCHNIEWIND, F. By-product coke ovens of U. S. Coke and Gas Co ..... R 370
SCHRADER, FRANK CHARLES. Reconnaissance along Alaska rivers ..... R 146
Science, world's progress in 1901 ..... R 209
Scopola vs. belladonna ..... R 234
Sea-urchin, effects of potassium cyanide on eggs of ..... R 319
SEAMAN, W. H. Evolution of metallic retorts ..... Pr 34
Secretary, annual report ..... Pr 16
SEIDELL, A. Solubility of mixtures of sodium chloride and sulphate, Pr 33, R 265. See Frank K. Cameron.
SELBY, A. D., and J. W. Ames. Miscellaneous chemical analyses ..... R 402
Selenates and tellurates, isomorphism of ..... R 2
Selenic acid, action on gold 354
Selenium, action on gold and silver salts, 918; Determination in organic compounds, 1087; Poison in beer, R 185; Toxicology ..... R 233
Septic tank, R 236; Action on acid iron sewage, R 423, 470, and bacterial contact beds, R 33; Fond du Lac, R 237; At Glencoe, Ill., R 34; At Ithaca, N. Y., R 180; At Plainfield, N. J., R 181; Vancouver, B. C. ..... R 38
Serpentine at Easton, Pa., R 126; Manhattan Island ..... R 126
Sewage, acid iron, action of septic tank on, R 423, 470; Streptococci in ..... R 472
Sewage treatment, bacterial purification, R 365; Effect of pickling liquids on, R 469; Filtration, R 31; German experiments with septic tanks and contact beds, R 325; Intermittent filtration at Brocton, Mass., R 472; new chemical precipitation plant, R 470; Of suburban houses, etc., R 327, 502; Precipitation, R 38; Prevention of pollution of streams by, R 504; Purification plants, R 424; Report of Royal Commission, R 37; Septic, R 366; Screening apparatus, R 183; Status in England ..... R 327
Sewage disposal works: Burton on Trent, R 238; Collingwood, N. J., R 368; Gardner, Mass., R 367: Lower Passaic Valley, R 182; Madison, Wis., R 34; New Orleans, R 183; Pawtucket, R 236; Pittsfield, Mass., R 367; Sydney, N. S. W., R 239; Wauwatosa, Wis., R 183; Worcester, Mass ..... R 32
Sewer ventilation in England ..... R 38
SEYEWITZ. See Lumiere.
SCHAEFFER, PHILIP A. See Otto Folin.
SHALER, N. S. The nature of volcanoes ..... R 409
SHAW, G. W. See F. J. Snow.
SHAW, ROSCOE H. Apparatus for analysis of sugar beets. R 247; See F. W. Woll.
SHEDD, O. M. See J. H. Kastle.
SHELDON, S. The electrochemical industries ..... R 353
SHERMAN, H. C. The determination of sulphur and phosphorus in organic materials 1100
SHERMAN, H. C., and H. M. Burr. The so-called gluten and diabetic foods ..... R 28
SHERMAN, H. C., and J. F. Snell. Relation of heat of combustion to S. G. in fatty oils 348
SHERMAN, H. C., J. L. Danziger and L. KOHNSTAMM. Maumené's test for oils 266
SHIELDS, W. S. Sewage purification by the septic tank, etc ..... R 236
SHIMER, P. W. See A. A. Blair.
SHINN, F. L. See R. E. Lyons.

Digitized by Google

SHIVER, F. S. A chemical study of the Sea Island cottonseed.....R 513
SIEBENTHAL, C. E. Limestone in Indiana.....R 8
Silage, steamed.....R 511
Silica, common errors in determination..... 362
Silicates, action of ammonium chloride on.....R 118
Silicides, hydrogen from.....R 221
Silicon, determination in ferro-silicon.....R 484
Silver, fusing-point and phase rule, R 440; In Kansas shales, R 495, 522; Losses in cupelling, R 462; Production, 1901, R 216; Texas mine, R 495; Chabasite and analcite, R 449; Chlorate, mixed crystals with sodium chlorate, R 447; Chloride, equilibrium with silver oxide, etc., 1141; Nitrate, test for oils, 396, 397; Salts, action of tellurium and selenium on..... 918
SILVERMAN, M. See A. L. Winton.
SINGER, SIDNEY K. See T. W. Richards.
Sipylite..... 414
SIRRINE, F. A. See W. H. Jordan.
SKILLING, WM. T. Dissociating power of hydrogen sulphide.....R 263
SLADE, H. B. A study of the enzymes of green sorghum.....R 511
Slag cement manufacture in Alabama.....R 241
SLOSSON, E. E. See W. C. Knight.
Smelting, Granby plant, B. C., R 300; New plant at El Paso, R 391; New plant of American S. and R. Co.....R 461
Smoke abatement in St. Louis.....R 296
SMITH, ALVIN J. The Americus limestone.....R 72
SMITH, AMELIA C. The influence of light, etc., on movements of the earth worm.R 233
SMITH, CHARLES E. Biography of.....R 154
SMITH, C. H., JR. Petrography of dikes in Syracuse, N. Y., R 449; Tourmaline contact zones near Alexandria Bay, N. Y.....R 411
SMITH, EDGAR F. Observations on the electrolytic precipitation of zinc and copper 1073
SMITH, EDGAR F., and Franz F. Exner. Ammonium vanadicophosphotungstate... 573
SMITH, ERASTUS G. The determination of chlorine in natural waters.....R 208
SMITH, GEORGE O. A geological study of the Fox Islands, Maine.....R 384
SMITH, J. W. Sewage disposal at Burton upon Trent.....R 238
SMITH, WILLIAM LINCOLN. The spectrum of the enclosed arc.....R 207
Snake venom, in relation to hemolysis, etc.....R 317
SNELL, J. F. See H. C. Sherman.
SNOW, F. J., E. W. Hilgard, and C. W. Shaw. Lanes of the Colorado Delta, etc....R 399
SNYDER, C. P. Wave number system for rhodium.....R 444
SNYDER, H. Human food investigations.....R 514
Soaps, metallic, from linseed oil..... 215
Soda (caustic), analysis of, 473; Electrolytic manufacture.....R 371, 395
Sodium, estimation as pyrosulphate, R 11; Manufacture by electrolysis, R 96; Carbonate, formation of an animal organism, 138; Chlorate, mixed crystals with silver chlorate, R 447; Chloride and sulphate, solubility of mixtures, Pr 33, R 265; Dioxide, action on metals, R 521; Hydroxide, action on wool, R 427; Nitrate and sulphuric acid, 222; Sulphate, power to neutralize ill effects of sodium chloride.....R 421
Soils, R 44; Alkali, R 101, 102; Alkali and vegetation, R 246; Alkali, in California, R 541; Analysis of, R 538; Analyses, R 135, 541; As an economic and social factor, R 328; Black marsh, R 331; Capillary studies, R 509; Deficiencies, pot experiment, R 134; Denitrification, 785; Determination of sulphuric acid in, 658; Division of, field operations 1900, R 243; Effect of continuous cropping, R 103; Effect of fertilizing on the humus, R 135; Estimation of acidity, and lime requirements, 1120; Experiments in evaporation, R 510; Filtration of clay from solutions, R 509; Fixation of nitrogen in, 1155; Fixation of phosphoric acid in, 1114; For greenhouse, R 373; Ionization of, relation of plant growth to, R 513; Method of sampling, 113; Mineral plant food in, 79; Nitrates in cultivated, R 330; Nitrification, 171, 528; Retention of salts near surface, R 135; Rothamsted, R 328;

Digitized by Google

Salton Basin, R 399; Service of, R 193; Survey in California, R 192; Texas tobacco.....R 328
Soil improvement, experiment.....R 330
Soil sediments under arid conditions.....R 541
Soil study.....R 103
SOLLMANN, TORALD. The combination of formaldehyde with Witte's peptone, R 363; Witte's peptone, its dissociation, etc.....R 364
SOLMANN, TORALD, and E. D. Brown. Effects of injection of proteids.....R 316
Solubility; Equilibrium between silver chloride, etc., 1141; Of gypsum.....667
Solutions, alloys as.....R 163
Sorghum, enzymes of green, R 511; In Delaware.....R 541
Solvents, pure, dielectric constants.....R 275
Specific gravity in fatty oils, relation of the heat of combustion to.....348
Specific heat: Of certain hydrocarbons, R 443; Of solutions, R 443; Of supercooled water.....R 443
Spectra of flames during basic Bessemer blow, R 3; Of hydrogen and some of its compounds, R 3, 268; Of the enclosed arc, R 207; Of water vapor.....R 444
Spectroscope, Steinheil's.....415
Spectroscopic studies.....R 444
SPENCER, ARTHUR C. The iron ores of Santiago, Cuba, R 80; See Whitman Cross.
SPERRY, ERWIN S. Aluminum silver, R 303; A method of phosphorizing metals, R 493; Phosphor bronze for hydraulic castings, R 463; Plaster of Paris as a brass founder's flux.....R 352
Sperrylite, new occurrence of.....R 151
SPEYERS, CLARENCE L. Molecular weights of some carbon compounds.....R 268
Spleen, relation to pancreas.....R 231
SPRING, W. Work of.....R 164
SPRINGER, ALFRED. Infectious diseases.....R 361
SPURR, JOSIAH E. The ore deposits of Monte Christo, Wash., R 453; The original source of the Lake Superior iron ores, R 410; Variation of texture in tertiary igneous rocks of Great Basin.....R 72
STACKPOLE, M. D. A new treatment of slimes from cyaniding talcose ores.....R 494
STANGER, W. H., and Bertram Blount. The rotary kiln process for cement.....R 100
STANLEY, O. O. See George T. Kemp.
Starch, hydrolysis of, R 386; In butter, Pr 35; Iodide.....865
STEAD, J. E., and F. H. Wigham. Influence of copper in steel wire.....R 18
Steel, art of supercarburizing, R 216; Bessemer, modified practice, R 414; Cambria Company's new works, R 299; Carbon in, 1076; Case hardening, R 216; Composition for various uses, R 490; Compression, R 154; Determination of molybdenum in, 273; Effect of melting with iron, R 459; Effect of work upon, R 18; Forgings for factory engines, R 84; Improved open-hearth process, R 84; Jupiter, R 18; Molybdenum, volumetric method, 186; New foundry of the Pennsylvania Steel Company, R 299; Progress of the Scotch industry, R 214; Soft center, R 490; Sault Ste. Marie works, R 18; *Crucible*, improved practice, R 390; Improvements of C. S. Co., of America, R 348; *Nickel*, R 415; Applications, R 17; For engine forgings, R 490; *Open-hearth*, early history in U. S., R 153: modern developments.....R 525
Steel rails, corrosion of, by sea-water, R 98; Re-rolling, R 348; Specifications for, R 17, 458; Structure of, R 489; Structure and durability.....R 492
Steel wire, influence of copper in.....R 18
STEHMAN, JOHN V. R. The application of Eschka's method to pig irons, 644; the determination of manganese in iron and steel.....1204
STEIGER, GEORGE. Note on silver chabazite and analcite, R 449. See F. W. Clarke. See J. S. Diller.
STEIGER, GEORGE, and E. T. Allen. A new government laboratory and its work, R 384
STEPHENS, F. J. Mineral features of Pahary, Malay Pen.....R 80
STEVENS, H. J. Lake Superior copper, R 300; 16th annual review of Lake Superior iron ore trade, R 211; The world's copper production.....R 459

Digitized by Google

STEWART, G. N. Action of saponin on corpuscles. ..... R 319
STEWART, MORRIS A. See Charles L. Parsons.
STOCKBRIDGE, H. E. Plant food trials ..... R 329
STODDART, CHARLES W. On the determination of sulphur in coal 852
STOKES, H. N. Pyrite and marcasite, R 9, 75. See Geo. P. Merrill
STONE, G. C. The Palmerton plant of the New Jersey Zinc Company ..... R 393
STONE, RODNEY H. Physiology of sea-water ..... R 534
Storage battery, the Edison, R 279; light weight, R 426; The Reuterdahl ..... R 41
Streptococci in sewage ..... R 472
STRUTHERS, JOS. Mining industries of Mexico ..... R 13
STUART, D. See G. E. Patrick.
STUART, W. Tomato culture with chemical fertilizers ..... R 193
Stylophorine 2
Stylophorum diphyllum, contribution to the chemistry of 1
Stylopine, 4 (fig.), 10; Compounds 12
Succinimide, production from nitrile 20
Sugar, R 46; Analysis of, R 539; And the new colonies, R 49; And the sugar beet, R 512; Beet, production of 1901, R 187; Cane, optical rotation in pyridine, R 271; The industry in Europe ..... R 187
Sugar beet, analyses, R 331; Apparatus for analysis, R 247; As a reclaimer of arid regions, R 512; Culture in Nebraska, R 374; Experiments in culture, R 331; Experiments in 1901, R 512; In Delaware, R 541; In Indiana, R 193; In Montana, R 375; Industry, progress in U. S. in 1901, R 512; Influence of environment on composition, R 134; Influence of manure on, R 247; Investigations in 1901 ..... R 400
Sugar-cane, rotation 940
Sulphates, double, of thallium and caesium, R 341; Double, solubility of, R 445; Estimation of sulphuric acid in, 774; Of bismuth, R 341; Relative bulk of weak solutions ..... R 439
Sulphur, and pyrites, R 74; At Trans-Pecos, Texas, R 205; Free, in Beaumont petroleum, R 288; In Calcasieu Parish, R 281; In coal, determination of, 852; In pig irons, determination of, 644; In protein bodies, 140; *Determination*, In organic materials, 1100; In plants, 346; In plant substances 1093
Sulphuric acid, action on sodium nitrate, 222; By electrolysis, R 506; In soils, determination of, 658; In soluble sulphates, estimation of, 774; New source of, R 509; Volumetric estimation of in alums 457
Surface, van der Waal's free-energy ..... R 270
Surface-tension, determination of ..... R 444
SUTHERST, W. F. The chemical changes in the ripening of cheese ..... R 375
SWAN, J. N. A hydrogen sulphide generator 476
SWANK, J. M. The capacity of our iron and steel works ..... R 345
Syenites, in Ontario ..... R 450

TAFF, JOSEPH A. Chalk of Southwestern Arkansas, etc., R 454; The Camden coal field, Ark ..... R 145
TAFF, JOSEPH A., and George I. Adams. Geology of Eastern Choctaw coal field. R 145
TAKAMINE, JOKICHI. Adrenalin, the active princle of the suprarenal glands ..... R 362
Talc and soapstone, in U. S., R 129; At Easton, Pa ..... R 126
Tannin, R 46; Determination ..... R 540
Tanning materials, analysis of ..... R 102
TAPPENDEN, O. S. Nickel steel for engine forgings ..... R 490
Tartar emetic, standard 828
Tartaric acid, estimation by polarimeter 928
TASSIN, WIRT. Catalogue of the meteorite collection in National Museum, R 411; The Casas Grandes meteorite ..... R 483
TAYLOR, ALONZO E. Cleavage products of proteids in degenerated liver ..... R 361
TAYLOR, B. Rise and progress of the Scotch steel industry ..... R 214
TAYLOR, THOMAS M. The ammonium tungstates 629
Technolexicon ..... Pr 75
Telluride, gold, natural 355

Digitized by Google

Tellurium, action on gold and silver salts, 918; Alloys with antimony, R 200; Alloys with lead, R 199; Atomic weight, 205; Tetrachloride 188
Temperature, variations in body ..... R 364
Tendon mucoid, composition ..... R 29
Tendenous tissue, chemical constituents of ..... R 91
Terpinene 650
Terpinolene 650
Testing Materials, Proc. Int. Ass'n ..... R 16
Thalenite, formula ..... R 152
Thallium, complex compounds and double salts, R 117; Double sulphates with caesium ..... R 341
THATCHER, R. W. Filtration in determination of crude fiber 1210
Theory of the cosmos, a ..... R 72
Thermochemical constant, a 882
Thermoregulators ..... R 444
Thermostats ..... 670, R 444, 445
Thiocyanates, 439, 680. R 21; Lead 570
THOMAS, GEORGE EDWARD, and Clarence A. Hall. New apparatus in water analysis 535
Thorium, atomic weight, 209; New separations of, 275, 901; Precipitants 543
THURNAUER, G. A review of alloys ..... R 461
TILSON, P. S. See H. H. Harrington.
Tin, alloys with aluminum, 258; At El Paso, Texas, R 127; Stream, in Alaska, R 128; Supplies ..... R 158
Titanium, see rutile.
TITCOMB, H. A. Louisiana rock salt ..... R 160
TOLLENS, B. The ash constituents of plants ..... R 133
TOLMAN, L. M. An investigation of soil sediments, etc., R 541; The polarization of fruits, jellies, etc., 515; Use of the Bechi test on olive oils. 396; See W. D. Bigelow.
TOLMAN, L. M., and L. S. Munson. Refractive indices of salad oils 754
TONGE, THOMAS. The mining development of Gilpin Co., Col ..... R 79
Tourmaline, chemical constitution of, R 119; Contact zones, New York, R 411; In Georgia granite ..... R 342
TOWAR, J. D. Sugar beet experiments in 1901 ..... R 512
TOWER, O. F. On the constitution of certain organic salts of nickel and cobalt, etc.. 1012
TOWER, R. W. See Erik H. Green.
TOWNSEND, CLINTON P. The Acker electrolytic alkali process, R 371; Recent developments in electrochemistry ..... R 419
Toxicology of plant substances ..... R 534
Trachyte of Sunset, Col ..... R 71
TRAPHAGEN, F. W. Sugar beets in Montana ..... R 375
Treasurer, annual report ..... Pr 20
TREVER, A. F. See A. H. White.
TREVOR, J. E. The nomenclature of variance ..... R 440
Triboluminescence 1
Tribromphenolbromide ..... R 227
Trichlorethylidenedinitrophenamines 1063
Trichlormethylparaconic acid 525
Trimethylbenzaldazine 1068
Trimethylbenzyltrimethylbenzal hydrazone 1068
Trimethylene cyanide, hydration of 25
Triphenylmethane, derivatives of, 607-622; Preparation of ..... R 163
Triphenylmethyl ..... 97 ff., R 88
Trivalent carbon 597
TROWBRIDGE, JOHN. Dissociation spectra of water vapor, etc., R 444; The spectra of hydrogen and some of its compounds ..... R 3, 268
TRUE, R. H. The prevention of molds on cigars ..... R 514
TUCKER, SAMUEL A. Note on the preparation of metallic lithium 1024
TUCKER, WM. C. A sewage disposal system for a country house ..... R 327

Digitized by Google

Tungstates, ammonium 629
Tungsten, R 74; Alloys with aluminum, 256; Atomic weight, 207; In Nevada, R 351; In U. S., R 128; Mine at Trumbull, Conn., R 282; Oxides, Pr 50, R 521; Production in 1901 ..... R 419
Tungsten steels, a volumetric method 187
TURNEAURE, F. E. Sewage disposal plant at Madison, Wis. ..... R 34
TURNER, H. W. Perknite (lime-magnesia rocks), R 7; The Esmeralda formation, R 144; Unusual minerals from the Pacific States ..... R 343
Tuyères, notes on ..... R 348
TWEEDDALE, W. Silica cement mortars ..... R 101
TWEEDY, GEO. A. Quicksilver mining in California ..... R 220

ULKE, TITUS. Electrolytic refining of composite metals ..... R 526
UNDERHILL, FRANK P. See Lafayette B. Mendel.
Uranium, R 74; Atomic weight, 208, R 268; Compounds, preparation from carnotite. R 19
Uranophane in Georgia ..... R 385
Ureas, substituted ..... R 313
Uric acid, determination of, in urine 562
Urine, albumin in, R 422; Relation of conductivity to composition, 996; Total sulphates in ..... R 318
Urine tests, influence of remedies on ..... R 464

VACUA, chemical method for obtaining ..... R 521
Vanadicophosphotungstate, ammonium ..... R 573
Vanadium, R 74; Compounds, preparation from carnotite ..... R 19
VANDERKLEED, C. E. See P. N. Evans.
Van der Waals' free-energy surface ..... R 270
VAN HISE, C. R. Iron ores of Lake Superior, R 147; The geology of ore deposits .. R 68
VAN HORN, FRANK R. Andesitic rocks near Silverton, Col. ..... R 123
Vanilla extract, analysis of 1128
VAN NAME, R. G. Estimation of copper as cuprous sulphocyanide ..... R 129, 289
VAN SLYKE, L. L., and W. H. Andrews. Report of analyses of Paris green, etc. ..... R 248
Vapor lamps, new forms of ..... R 96
Vapor-tensions, determination of small 864
Vaporization, heat of, of certain hydrocarbons ..... R 443
Variance, nomenclature of ..... R 440
VAUGHAN, T. W. The copper mines of Santa Clara Province, Cuba ..... R 157
VEATCH, A. C. The salines of North Louisiana ..... R 455
VEITCH, F. P. Estimation of soil acidity and lime requirements of soils 1120
Venom, serpents' ..... R 230
Ventilation, for hospitals ..... R 184
VERRILL, A. E. Peculiar character of the eruption of Mt. Pelee ..... R 448
Vicilin, sulphur in 153
VICKERS, C. Sand castings of copper ..... R 86
Vignin, sulphur in 148
Viscosity, determination of ..... R 444
Volcanoes, dust, R 409; Nature of, R 409; Ejecta, discussion of analyses, R 448; Eruptions in the West Indies ..... R 447, 448, 449
VOLNEY, C. W. Decomposition of sodium nitrate by sulphuric acid (Part III) 222
Voltameter, accuracy of improved ..... R 442
VOORHEES, E. B. Field experiments with nitrate of soda on market garden crops R 510; Studies in denitrification 785
VULTÉ, HERMAN T, and Harriet Winfield Gibson. Metallic soaps from linseed oil .. 215

WACKSMANN, M. The influence of chemical compounds on the pancreatic ferment ..... R 498
WADDELL, JOHN. Sugar and the sugar beet ..... R 512
WALKER, E. Hargreaves-Bird process for electrolytic production of soda, etc ..... R 395
WALKER, R. A. The Pittsburg iron trade in 1901 ..... R 215
WALLACE, E. C. See Clifford Richardson.

Digitized by Google

WALTERS, HARRY E. Colorimetric estimation of manganese.....R 12
WARD, H. A. The Veramin meteorite.....R 75
WARREN, EDWARD R. The result of imperfect combustion of fuel.....R 501
WASHINGTON, HENRY S. Igneous rocks from Eastern Siberia, R 204; The foyaite-ijolite series of Magnet Cove.....R 119
Washington Section .....Pr 32, 40, 50
Waste, trade, bacterial treatment of.....R 503
Waste liquors, pollution of streams by .....R 179
Water, analysis of geyser spring, R 151; Analysis of a magnesia, R 72; Artesian, analyses, R 411; Chlorine in, R 453; Development in California, R 481; Fever epidemic at Baraboo, Wis., R 240; Filtration, R 175, 176; Mechanical filtration, R 425; Mineral, classification of, Pr 41; Mineral springs in Austria, R 152; Sanitary inspection in Massachusetts, R 180; Sanitary protection at Baltimore, R 178; Subterranean, Louisiana, R 455; Sea, physiology of, R 534; Significance of phosphates in, 735; Specific heat of supercooled, R 443; Sterilization, ozone for, R 327; Treatment for locomotive use .....R 188
Water analysis, bacteriological, R 173; Determination of chlorine, R 208; New apparatus, 535, 897; Oxygen absorption test, R 323; Portable outfit, R 240; Second report of committee on standard methods.....R 36
Water purification, R 100, 323; At Pittsburg, R 237; Automatic, R 427; Plants in U. S .....R 368
Water-supply: From a sanitary standpoint, R 72; Tunnel, the Cleveland, R 122; Idaho, R 125; Report on St. Louis, R 326; Vermont .....R 176
Water softener: R 100, 190; Kennicott, R 372 397
Water vapor, dissociation spectra.....R 444
Water-gas, carburetted, R 94; Apparatus for demonstrating manufacture. .....R 200
WATERS, C. E. Apparatus for demonstrating manufacture of water-gas.....R 200
WATKINS, H. C. See J. O. Schlotterbeck.
WATSON, FLOYD R. Determinations of surface-tension and viscosity.....R 444
WATSON, L. H. Gastric acidity..... R 499
WATSON, THOMAS L. Occurrence of aplite, etc., in the Stone Mountain granite, R 342; On the occurrence of uranophane in Georgia, R 385; The Georgia bauxite deposits, R 120; The granitic rocks of Georgia, R 120; Weathering of granitic rocks in Georgia.....R 123
WEBER, F. C. See J. T. Willard.
WEBER, J. E. On an adulteration of lavender oil with salicylic acid..... 1027
WEED, WALTER H. Carolina gold deposits, R 13; Influence of country rock on mineral veins, R 204; Mineral vein formation in Montana, R 144; Ore deposits of the Elkhorn mining district, Montana, R 283; Recent developments in Southern copper deposits, R 493; The El Paso tin deposits.....R 127
WEED, W. H., and L. V. Pirsson. Geology of Montana laccoliths.....R 122
Weeds, destruction by chemicals.....R 191, 401
WEEKS, FRED B. Bibliography and index of North American geology, etc., for 1901, R 524
WEEMS, J. B. The evolution of the oxygen absorption test in water analysis.....R 323
WELLER, H. R. See Alvin S. Wheeler.
WELLMAN, S. T. History of open-hearth steel in U. S .....R 153
WELLS, H. C. Generalizations on double halogen salts.....R 1
WELLS, H. GIDEON. Reversibility of enzymes.....R 231
WELLS, H. L., and S. L. Penfield. New occurrence of sperrylite.....R 151
WELLS, J. S. C. A new departure in manganese mining, R 492; Progress in the cyanide process in 1901 .....R 218
WELSH, M. D. See F. J. Alway.
WESENER, J. A. A nitrogen apparatus..... 388
WESTCOTT, THOMPSON S. Modification of proteids in milk mixtures.....R 28
Weyl's albuminate, relation of edestin to..... 28
WHEELER, ALVIN S., and H. R. Weller. Condensation of chloral with the nitranilines 1063
WHEELER, H. J., and G. E. Adams. Grass experiments.....R 400

Digitized by Google

WHEELER, HENRY L. On the molecular rearrangement of acylthioureas, etc., R 528; Thiocyanates and isothiocyanates.....R 21
WHEELER, HENRY L., and Alling P Beardsley. The action of phenylhydrazine on certain esters.....R 356
WHEELER, HENRY L., and George S. Jamieson. Thiocyanates and isothiocyanates . 743
WHEELER, HENRY L., and Henry F. Merriam. Thiocyanates and isothiocyanates... 439
WHEELER, HENRY L., and Treat B. Johnson. Acetyl and benzoyl pseudothioureas, R 89; On certain substituted ureas, R 313; Thiocyanates and isothiocyanates 680
WHIPPLE, G. H. See Walter Jones.
WHITE, ALFRED H. Volumetric analysis of alums..... 457
WHITE, A. H., and A. F. Trevor. Theory of the incandescent mantle.....R 505
WHITE, B. O. See C. H. Jones.
WHITE, GEO. R. See Henry B. Hill.
WHITE, I. C. Geology of West Virginia.....R 81
WHITE, L. N. The Virgilia copper district.....R 81
White, T. H. See H. J. Patterson.
WHITNEY, A. W. Metallography in car wheel manufacture.....R 299
WHITEY, MILTON. Field operations of the division of soils, 1900.....R 243
WHITSON, A. R. See F. H. King.
WIANCKO, A. T. See T. L. Lyon.
WIDTSOE, J. A., and L. A. Merrill. Arid farming or dry farming.....R 375
WIECHMANN, F. G. Volcanic dust.....R 409
WIGHAM, F. H. See J. E. Stead.
WILCOX, GUY MORRIS. The optical rotation of cane-sugar in pyridine.....R 271
WILEY, H. W. Agriculture in its relation to bacteria and other ferments, R 511; influence of environment on composition of the sugar-beet.....R 134
WILLARD, J. T. Effect on soil of continuous cropping of wheat.....R 103
WILLARD, J. T., and A. T. Kinsey. Effect of oxygen on animal life.....R 93
WILLARD, J. T., R. W. Clothier, F. C. Weber, et al. Analyses of corn, etc .....R 374
WILLIAMS, CHARLES B. New apparatus, 246; Determination of sulphuric acid in soils..... 658
WILLIAMS, R. B. Septic tanks at Ithaca.....R 180
WILSON, E. Commercial importance of aluminum.....R 20, 302
WILSON, HUGH. Further experiments on the antitoxic effect of ions.....R 468
WINCHELL, A. N. Note on certain copper minerals.....R 4
WINCHELL, N. H. The iron ores of Minnesota.....R 282
WINGHAM, A. The internal strains of iron and steel, etc.....R 84
WINSLOW, C. E. A. The bacteriological analysis of water.....R 173
WINSLOW, C. E. A., and Miss M. P. Hunnewell. Streptococci in sewage.....R 472
WINTON, A. L., and M. Silverman. The analysis of vanilla extract..... 1128
WINTON, A. L., et al. Sixth report on food products.....R 331
WITHERS, W. A., and G. S. Fraps. Nitrification in different soils..... 528
WITHYCOMBE, J., and A. L. Knisely. Preliminary report on steamed silage.....R 511
WOLFF, JOHN E. Leucite-tinguaite, Beemerville, N. J.....R 285
WOLFF, JOHN E., and Chas. Palache. Apatite from Minot, Maine.....R 285
Wolframite, in the Black Hills.....R 204
WOLL, F. W. On the average composition of milk .....R 247
WOLL, F. W., and R. H. Shaw. Experiments in sugar beet culture in 1900 and 1901.R 331
WOOD, HORATIO C. Effect of digestion of gelatine on its styptic properties .....R 464
Wood tar from the Douglas fir.....764
WOODBURY, J. M., and H. deB. Parsons. Proposed refuse crematory for N. Y. City.R 369
WOODMAN, A. G. Portable outfit for water analysis, R 240; New apparatus in water analysis, 897; The significance of phosphates in natural waters..... 735
WOODRUFF, I. O., and William J. Gies. On the toxicology of selenium.....R 233
Wool, action of caustic soda on .....R 427
WORDSLEY, B. H. More light in the dark room.....R 370

X-RAYS, varying activism of .....R 441
Xenotime, relation to hussakite.....R 450

Digitized by Google

Digitized by Google